
UTAH

FOREST WATER QUALITY GUIDELINES MONITORING

AUDIT REPORT



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Utah's Forest Water Quality Guidelines

2006 Monitoring Program Report - Baseline Data



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EXECUTIVE SUMMARY

This report summarizes findings of Utah's Forest Water Quality Guidelines (FWQG) Monitoring Program for forestry activities during the period 2002-2005. The FWQG Monitoring Program was developed in response to Utah's Non Point Source Management Plan for Silvicultural Activities (1998) and the Utah Forest Practices Act (2001). Results are based on 40 audits (representing a 50% survey) conducted across the state on non-federal lands, and represent baseline data for Utah. Monitoring attempts to assess both the degree of FWQG implementation and effectiveness of minimizing or reducing non-point sources of pollution related to forestry activities.

Utah's Forest Water Quality Guidelines are a collection of voluntary field applicable practices designed to protect water quality during forestry activities. The FWQG were adopted by the State and are contained in Utah's Non-Point Source Management Plan. The 1998 Silviculture Addendum uses Forest Water Quality Guidelines as the basic management practice, and serves as the cornerstone for protecting forest resources and water quality. Properly applied, the FWQG can minimize non-point source pollution produced from timber harvesting activities.

The FWQG monitoring process consists of gathering information through field auditing timber harvesting activities, and qualitative evaluations of both the application and effectiveness of applicable FWQG practices. During the period 2002-2005, the Utah Division of Forestry, Fire and State Lands (FFSL) conducted post-harvest field audits on 40 sites. Over 1,500 applicable forest practices were rated. The audits are based primarily on visual assessments and professional judgement of those conducting the audits, and decisions are based on consensus among audit team members. This report provides baseline information and summarizes findings of Utah's FWQG Monitoring program for forestry.

The goals and objectives of Utah's FWQG Monitoring program are to develop and implement a forest water quality monitoring and evaluation program, and to demonstrate the application of the FWQG as being effective in reducing non-point source pollution and protecting forest, soil and water resources. To meet these objectives, FFSL identified the following strategies. Through a field review process:

- Determine if FWQG are being applied during timber harvesting operations. This is the process of systematically gathering information to determine whether FWQG are being applied and applied in the intended manner.

- Assess the relative effectiveness of FWQG at reducing non-point source pollution related to timber harvesting activities. This is the process of information gathering and evaluating whether the application of FWQG achieves the anticipated or desired resource protection.
- Identify and provide a feedback mechanism on the need to revise, clarify or strengthen the FWQG.

Data collection utilizes a field-based method designed to focus on assessing both the application and effectiveness of applicable FWQG. The intent of FWQG monitoring is to conduct on-site, post-harvest reviews for all timber harvesting activities occurring on state and private lands in the state. Assuming access is allowed, each site is given an evaluation by not less than a two-person assessment team. The team gathers information which will be used to evaluate FWQG application and effectiveness. Conducting this phase of the monitoring program is considered to be routine follow-up with landowners and is incorporated into the division's normal operating procedure.

Forty sites were evaluated for **FWQG application**. Audit results showed that across all ownerships, FWQG were properly applied 81% of the time. Although many harvest sites had at least one instance where a FWQG was inadequately applied, the majority of these departures were minor and did not cause erosion or deliver sediment to water resources.

Similarly, sites were evaluated for **FWQG effectiveness**. Audit results showed that across all ownership, FWQG were effective in protecting forest, soil and water resources 79% of the time. Minor departures in effectiveness produce minor impacts to forest, soil and water resources where erosion occurs but is not delivered to streams of other water resources.

Summary of FWQG Application and Effectiveness by Ownership

Practice	Ownership	
	State	Private
FWQG Application	81%	81%
FWQG Effectiveness	80%	78%

INTRODUCTION

Forests are an important natural resource in the state of Utah. Typically, Utah's forests are situated at elevations where precipitation is generous enough to allow trees to grow, and are covered with abundant coniferous and deciduous species. These forests make important contributions to the state's quality and way of life by providing numerous resource benefits such as wood fiber, fish and wildlife habitat, recreational opportunities and clean air and water. Being the second-most driest state in the West, clean water is essential to Utah's diverse economy.

Findings from the 1996 Utah Forest Practices Task Force indicate that timber harvesting on Utah's non-federal lands has increased in recent years. This trend is expected to continue as population and wood product demand continues to increase. Conducted improperly, timber harvesting sometimes leads to land degradation. The negative impacts of poor timber harvesting can include soil erosion, sedimentation and decline in water quality.

Nearly one-third of Utah's 53 million acres is occupied by forest mostly above 5,000 feet. These "timberlands" represent approximately 3.4 million acres. Roughly, 20% of the timberland in Utah is privately-owned with the remaining 80% being owned by the federal government.

Across the nation, natural resource managers and the public are concerned with impacts to water quality resulting from non-point source pollution. Non-point source pollution is defined as diffuse sources of water pollution that originate from many indefinable sources and do not discharge at a specific, single location. Non-point source pollutants are generally carried over or through the soil and ground cover via storm-flow processes (Non-point Source Management Plan for Silvicultural Activities, 1998). Eroded soil or sediment is the single-most non-point source pollutant affecting our nation's water resources (U.S. Environmental Protection Agency, 1992).

Many land uses cause non-point source pollution including agriculture, construction activities, urban and rural development and forest management activities. Nationally, it is estimated that between 3-9% of all non-point source pollution originates from forest management practices (U.S. Environmental Protection Agency, 2005). In Utah, estimates are difficult to obtain. However, it is generally assumed to be a small percentage of total non-point source pollution. But, local site conditions can cause serious water quality and other resource impacts (Utah Non-Point Source Management Plan, 2000). Also, the cumulative effects of pollution from many localized, small sources can have a significant impact on water quality.

Since the 1970s, non-regulatory Forestry Best Management Practices (BMPs) have provided guidance as minimum water quality protection standards for forestry operations. The 1987 amendment to the Clean Water Act of 1972 recognized the need for control strategies for non-point source pollution. The act directed states to identify land use activities that contribute non-point source pollution and to adopt measures to control those sources. Silviculture or forest management has been identified as a possible source of non-point source pollution.

The 1998 Silviculture Addendum to Utah's Non-Point Source Management Plan prescribes voluntary Forest Water Quality Guidelines to protect water quality, and outlines an implementation method for the promulgation and adoption of these guidelines. Utah's FWQG are similar to other states' forestry Best Management Practices (BMPs). In response, the Utah Division of Forestry, Fire & State Lands developed the FWQG Monitoring Program which functions within a non-regulatory and entirely voluntary framework.

Utah's Forest Water Quality Guidelines are a collection of voluntary measures landowners, loggers and resource managers can use to provide for the protection of forest, soil and water resources. Utah's FWQG are explained in the publications, ***Utah's Forest Water Quality Guidelines: A Practical User's Guide for Landowners, Loggers and Resource Managers***, and ***Utah's Forest Water Quality Guidelines: A Technical Manual for Landowners, Loggers and Resource Managers***.

Prior to 2001, timber harvesting activities in Utah went largely unchecked due to the lack of information related to the location of these activities. There was no formal or legal process for operators or landowners to notify the Division of their intentions to harvest timber. The 2001 Utah General Legislative session enacted the Utah Forest Practices Act (H.B. 144). Under 65A-8a, the FPA requires operators to:

- Register with the Division of Forestry, Fire & State Lands.
- Provide notification of intent to conduct forest practices to the Division of Forestry, Fire & State Lands. The notification of intent must be submitted to the Division no later than 30 days prior to an operator commencing forest practices.

The **registration** requirement provides a mechanism that identifies who is operating in Utah. The **notification** requirement provides the means of identifying where forestry activities are occurring in the state. The FPA also provides direction to the Division of Forestry, Fire & State Lands to promote the implementation of the FWQG through technical assistance and education to landowners and loggers. Under the law, the Division of Forestry, Fire & State Lands is required to acknowledge receipt of all notifications and provide information on Utah's FWQG to operators and landowners.

Utah's FWQG audit process is a widely used and accepted means of evaluating forest practices. Monitoring and evaluation of the FWQG includes determining the level of awareness and acceptance of the FWQG, and field auditing of harvested sites to determine the degree of voluntary implementation and effectiveness of the FWQG which are designed to protect forest, soil and water quality. Implementation, or compliance monitoring, is a widely used and accepted method of evaluating forest practices, and serves as a surrogate for more expensive quantitative water quality sampling and monitoring.

Since BMPs and, in Utah's case, FWQG are recognized by state and federal legislation as a method to control non-point source pollution, it makes sense to validate their application and effectiveness as part of an overall monitoring program. States are increasingly relying on qualitative surveys to assess and monitor forestry practices. States such as Oregon, Idaho, Montana, Minnesota and Wisconsin all use a similar approach to Utah to assess control of non-point source pollution resulting from forest practices.

Assessing silvicultural impacts to water quality has been conducted previously in Utah. The first statewide assessment of forest practices was conducted in 1982. At that time, silviculture did not receive much attention. The consensus among land managers was that silviculture-related problems were insignificant. The rationale for arriving at this conclusion was based on the level of timber harvesting occurring in the state. At the time, approximately ninety-percent of the timber being harvested originated from federal land, while little information existed on the level of output from other lands in Utah and the potential impact on water quality. Findings from the 1982 report indicated only minor concerns related to silvicultural impacts (Kappe, 1982).

This report presents the first cycle of FWQG audit findings for Utah's monitoring program since 1982. It is anticipated that FWQG audits will be conducted on a continuous, on-going basis with accompanying reports being produced every three years.

METHODOLOGY

In Utah, assessing silvicultural impacts and their relationship to non-point source pollution has occurred infrequently. Consequently, describing trends associated with timber harvesting activities on non-federal lands in Utah and their impact on water quality is difficult. This report presents the first cycle of FWQG audit findings for Utah's monitoring program in over 20 years. It is anticipated that FWQG audits will be conducted on a continuous, on-going basis with accompanying reports being produced on a three-year cycle.

Goals and Objectives

From the Division's perspective, the purpose of Utah's FWQG Monitoring Program is to effectively demonstrate application of the FWQG, and if they are providing the intended or desired protection to forest, soil and water resources. Through a field review process, a FWQG monitoring and evaluation program has been developed to systematically gather information to address the subjects of FWQG implementation and effectiveness within a qualitative context. The objectives of Utah's FWQG Monitoring Program are to:

1. Determine if the FWQG are being applied during timber harvesting operations.
2. Assess the relative effectiveness of the FWQG at reducing non-point source pollution related to timber harvesting activities.
3. Identify and provide a feedback mechanism on the need to revise, clarify or strengthen the FWQG.

Monitoring Approach and Strategy

Previously, monitoring efforts were hampered by the Division's inability to identify and locate where forest management activities were occurring on the landscape. With the passage of the Utah Forest Practices Act (FPA) in 2001, operators are required to notify the Division of their intent to conduct forest practices through the Notification of Intent (NOI) process. The Division now has a mechanism that provides a point of contact for operators and landowners and the location of forest practices.

Within the context of the FPA (which recognizes the need to promote the implementation of the FWQG before, during and after the conduct of forest practices), there is tacit approval from the state legislature to establish and conduct non-point source water pollution monitoring related to silvicultural activities. Furthermore, the 1998 Non-Point Source Management Plan for Silviculture Activities established the Forest Water Quality Guidelines and outlines an implementation method for the promulgation and adoption of the FWQG.

To be successful, Utah's FWQG Monitoring Program relies heavily on cooperation among landowners and other participating entities, particularly the forest products industry. Designed within a voluntary, non-regulatory framework, the FWQG Monitoring Program should be thought of in terms of an assessment or evaluation rather than something designed to bring about enforcement actions. Due to the qualitative nature of the monitoring process, monitoring forest practices is conducted in the relative sense as opposed to absolute quantification. For example, the intent of monitoring the FWQG is not to determine how much sediment is entering a stream. Rather, the focus is to determine if soil movement is evident, whether sediment is entering a stream and, if so, its potential or actual relative impact on water quality. Similarly, monitoring FWQG practices in this sense is not intended to identify poor operators or performance among the timber industry. However, it is understood that Utah's forest industry will be a leader and utilize the FWQG in a voluntary, self-policing fashion in an effort to provide desirable resource protection and long-term benefits. Acceptance and implementation of the FWQG within a voluntary context may forestall or preclude the need for future regulation of timber harvesting.

FWQG monitoring targets harvesting activities occurring on non-federal forest lands throughout Utah, and incorporates a combined, two-phased approach. Under the Division's monitoring strategy, **continuous monitoring** refers to auditing all timber harvesting activities on state and private lands, and is largely dependent upon operator compliance with the FPA Notification of Intent requirement and the Division's ability to conduct FWQG audits in a timely manner. **Periodic monitoring** consists of re-visiting selected sites, which meet specific criteria, previously evaluated under the continuous monitoring phase. **Findings reflected in this report are based entirely on FWQG audits conducted during the continuous monitoring phase.** Periodic monitoring will be implemented if determined to be warranted or if the need arises.

Development of Field Audit Process

Utah's FWQG audit process and procedures were developed by FFSL in consultation with the Division of Water Quality (DWQ). The audit process is based on the designs used by several states including Montana, Minnesota and Wisconsin. The process and procedures resulted in the following:

- Development of field audit rating guide and forms.
- Organization of calibration workshop(s) to ensure consistent application of rating standards.
- Development of consistency standards.
- Reporting results from field audits.
- Modification of the audit process if appropriate.

FWQG Audit Teams

Six audit teams were formed to conduct the audits, each representing their respective administrative area. Monitoring involved teams visiting and evaluating timber harvesting activities to determine if and to what extent the FWQG were being applied. To improve credibility and consistency among the teams, each was comprised of at least a two-person team. In the majority of cases during the field auditing, teams were comprised of three persons including an area representative (Area Manager or Area Forester), administrative staff, and program manager (Forest Management). It should be noted that every attempt was made to solicit participation in the audit process from other state, federal and local agencies, landowners and forest industry.



Photo 1: Audit Team conducting post-harvest FWQG Audit.

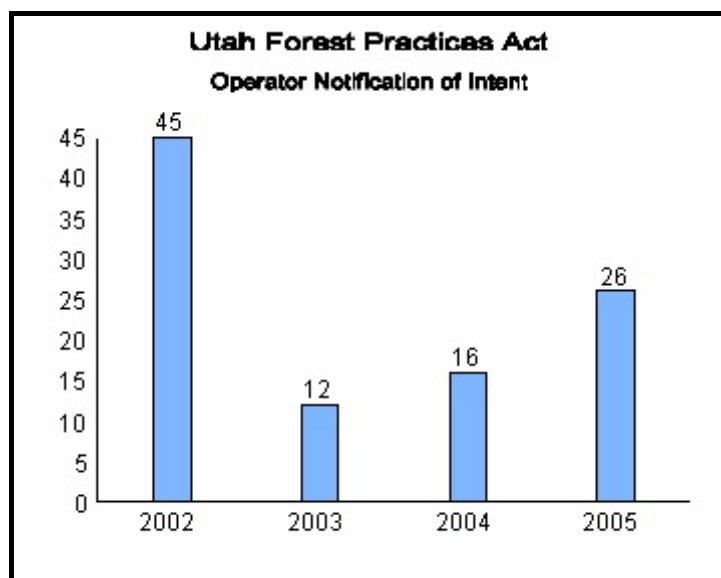
The Study Area

The study area encompasses the entire state of Utah, which is divided into six administrative areas. With the exception of the Central Area, at least one FWQG audit was conducted in each of the following administrative areas:

Administrative Area	Counties
Bear River	Cache, Rich, Box Elder and Weber
Wasatch Front	Davis, Morgan, Salt Lake, Tooele and Utah
Northeast	Wasatch, Summit, Duchesne, Uintah and Daggett
Central	Millard, Wayne, Piute, Juab, Sevier and Sanpete
Southeast	Carbon, Emery, Grand and San Juan
Southwest	Beaver, Garfield, Kane, Iron and Washington

Sample Size and Distribution

Under the continuous monitoring phase, there is no specific target for the number of sites to be audited. Through the FPA - Notification of Intent process, continuous monitoring proposes to conduct post-harvest audits on all timber harvesting activities occurring on non-federal lands in Utah. During the years 2002-2005, the Division received **99** notifications to conduct forest practices. The following graph displays the number of NOI received:



Since 2002, the Division has seen a decline in the number of NOI being submitted by operators, although a gradual increase has occurred over the past three years. While the FPA requires operators to notify the Division of their intent to conduct forest practices, there are no enforcement authorities or penalties for operators who do not comply with the requirement. Based on documented accounts, the Division is aware of several timber harvesting operations where no NOI has been received. In the past year alone, it is estimated there were 20 active timber harvesting operations occurring on private land without the Division being notified. This figure represents roughly 43% of the timber harvesting activities in 2005 where no documented notification of intent exists. In some cases, assistance in preparing the NOI had been provided to operators, yet they still failed to submit the NOI to the Division. Uncertainties exist about the level of FWQG compliance with these unreported activities. Several other factors may also explain the reason for declining NOI:

- Increase timber harvesting on federal lands.
- Less reliance on timber from private forest lands.
- Importing raw materials from other areas.
- Loss of industry/jobs and operators moving out of state.
- Landowners not selling or poor market conditions.
- Operators unaware of the registration and notification requirement.

A total of 43 sites were audited during this same period. However, three audits were determined to be of little value due to insufficient data and are not included in this assessment. The remaining 40 sites are distributed across the state. Audits were conducted on two ownership groups:

- Non-industrial private forest land (NIPF).
- State trust lands (SITLA).

An associated issue that affects the number of potential audits is that of access. Monitoring is voluntary, and thus permission to access a site must be granted by those who own the land. The School and Institutional Trust Lands Administration (SITLA) has agreed to allow access to audit sites. However, with non-industrial private forest landowners (NIPF), the Division must obtain permission from each individual landowner prior to conducting an audit on their property. The Division initiates follow-up action with both landowners and operators subsequent to receipt of an NOI through written and verbal requests. An unsuccessful response from the landowner is determined to be a denial of access to enter the property. Access to conduct FWQG audits on private forest lands was denied on 14 occasions.

Table 1: FWQG Audit Sample Size

FWQG Audits	Ownership		Total
	Private (NIPF)	State (SITLA)	
Audit Sites	33	7	40
% Audited	83	17	100
Notification of Intent (NOI)			
Total	Inactive	Denied Access	Audits*
99	3	14	82

*Reflects the maximum number of FWQG audits in the sample size.
Of the 82 possible audits, 40 audits (49%) were conducted.

Site Selection

Since continuous monitoring targets all harvesting activities occurring across the state on non-federal lands, consideration of site selection criteria and distribution is not warranted.

The Audit Rating Form

Audit teams used a rating form to determine and evaluate both FWQG application and effectiveness. Each audit site has a potential maximum of 76 FWQG practices. Rating FWQG application and effectiveness for each practice used a 5-point scale and 6-point scale respectively. The FWQG Audit Rating Form and Procedures for Conducting FWQG Audits are included in the Appendix.

Audit teams rated FWQG application first by identifying whether the FWQG was applicable to the site and, if so, whether it was applied in the correct manner and in the proper location. To help with determining application and effectiveness rating, audit teams employed the use of the flow chart described in the Appendix. Lack of adequate application or misapplication are considered departures from the FWQG. Audit teams employed the use of the following rating guide when considering FWQG application:

- 5** - operation exceeds FWQG
- 4** - operation meets FWQG
- 3** - minor departure from FWQG
- 2** - major departure from FWQG
- 1** - gross neglect of FWQG

Ratings of 5 and 4 are self-explanatory. Minor departures from the FWQG (**rating 3**) refers to departures of small impact potential distributed over a localized area, or over a larger area where the potential for impact(s) is low. Major departures from the FWQG (**rating 2**) refers to departures of large impact potential or to the FWQG not being applied. Gross neglect (**rating 1**) refers to large and direct impacts being clearly evident and disregard for FWQG application.

Similarly, audit teams rated FWQG effectiveness to determine the relative degree of providing expected or desired protection to forest, soil and water resources. Guidance for rating FWQG effectiveness is defined by the following:

- 6** - improved protection of forest, soil and water resources
- 5** - adequate protection of forest, soil and water resources
- 4** - minor and temporary impacts on forest, soil and water resources
- 3** - minor and prolonged impacts on forest, soil and water resources
- 2** - major and temporary impacts on forest, soil and water resources
- 1** - major and prolonged impacts on forest, soil and water resources

Definition of Terms	
Adequate	FWQG applied correctly; small amount of material eroded; material does not reach drainages, streams, lakes or wetlands
Minor	FWQG applied incorrectly; small impact potential; erosion and delivery of material to water resources not clearly evident
Major	FWQG not applied; large impact potential; erosion and delivery of material to water resources clearly evident
Temporary	Impacts lasting one year or less; no more than one runoff season
Prolonged	Impacts lasting more than one year

There are a maximum number of 76 FWQG practices to rate on each site if all FWQG are applicable. In most cases, however, not all FWQG applied. In several instances, sites did not have streamside management zones, stream crossings or forested wetlands. In others, treatment and disposal of slash was not completed or the FWQG could not be rated during the time of the audit. Those FWQG having to do with timing of operations during the harvest cannot be rated post-harvest. Hence, in these cases, the teams did not rate these practices. Given that 40 audits were conducted, the maximum number of practices that could have been evaluated was 3,040. On average, roughly half (49.8%) of all practices (1,515) were evaluated on all sites contained in the study area.

FWQG Audit Limitations

The FWQG auditing process is based largely on a one “point-in-time” qualitative visual observation of the site, most often looking for evidence of erosion and sedimentation. Typically, this approach documents impacts that normally occur during the first or second year after harvest. This is generally the critical period for erosion associated with timber harvesting. Some practices conducted during the operation cannot be easily evaluated in post-harvest audits. The assessment is based on visual appraisals of practices and impacts to forest, soil and water resource, and are a snapshot in time of the applied practices and subsequent impacts. It is understood this sort of qualitative evaluation is not as precise as more expensive quantitative methods. Nevertheless, the FWQG audit process is an effective means to evaluate their implementation and provides valuable information in a cost-effective manner.

RESULTS AND DISCUSSION

During the period 2002-2005, 40 sites were audited for voluntary FWQG compliance (Tables 2 and 3). The sites were distributed throughout the state with the highest proportion of sites located in the southeast area (45%) and northeast area (28%). By far, the majority of the FWQG audits were conducted on NIPF lands (83%) while state-owned lands (SITLA) accounted for 17% of the audit sites. Carbon, Emery and Duchesne counties accounted for almost sixty-percent of the FWQG audits conducted. A total of 1,515 individual practices were rated.

The majority of rated practices were associated with timber harvesting and activities related to road construction and skid trails. Few practices were rated for streamside management zones (SMZ), chemical management, prescribed fire and forested wetlands.

Table 2: FWQG Audits Completed by Year and Ownership Group

Ownership	Year				
	2002	2003	2004	2005	Total
Private	3	11	6	13	33
State	1	2	0	4	7
Total	4	13	6	17	40

Table 3: FWQG Audits Completed by Area for Each Ownership Group

Ownership	Number of Sites Audited						
	Bear River	Wasatch Front	Northeast	Central	Southeast	Southwest	Total
Private	1	5	9	0	15	3	33
State	0	1	2	0	3	1	7
Total	1	6	11	0	18	4	40

Statewide Application of FWQG

Proper application of the FWQG by landowners, operators and resource managers requires the selection and installation of the appropriate FWQG that collectively prevent or minimize impacts to forest, soil and water resources.

Audit teams rated a total of 1,515 practices to assess how landowners and operators applied the FWQG during timber harvesting activities. Application of the FWQG measures whether they were applied, whether they were applied correctly and whether they were applied in the proper locations on the harvested area. Tables 4 and 5 display statewide results relevant to FWQG application.

Table 4: FWQG Practices Rated by Ownership Group

	State		Private	
Practices Rated	Application	Effectiveness	Application	Effectiveness
Streamside Management Zone	0	0	71	71
Planning for Roads	27	27	141	141
Road Construction	25	25	127	127
Stream Crossings	4	4	66	66
Road Maintenance	24	24	106	106
Skid Trails	38	38	188	188
Landings	26	26	138	138
Timber Harvesting	40	40	230	230
Site Prep, Regen. & Revegetation	22	22	106	106
Chemical Management	3	3	27	27
Prescribed Fire	4	4	64	64
Forested Wetlands	0	0	38	38
Total Practices Rated	213	213	1,302	1,302

Table 5: Statewide FWQG Application - Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	1,302	81	14	4	<1
State	213	81	15	5	0
All Sites	1,515	81	14	4	<1

Table 6: Statewide FWQG Application - Number of Departures

Ownership	# Rated Practices	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	1,302	368	110	6
State	213	62	20	0
Total	1,515	430	130	6

Explanation

The preceding results indicate that voluntary compliance with Utah FWQG is relatively high. Overall, the vast majority of rated practices were applied correctly 81% of the time (Table 5). Collectively, 566 departures (37%) occurred across all ownerships, with the majority being only minor departures. Of the 1,515 rated practices, 430 were minor departures (28%). Major departures and gross neglect were found less than 9% and less than 1%, respectively of the rated practices.

Statewide Effectiveness of FWQG

FWQG effectiveness measures how well (relatively) the FWQG protects forest, soil and water resources. Audit teams rated a total of 1,515 practices for FWQG effectiveness. Tables 6 and 7 summarizes FWQG effectiveness of all audited practices by ownership.

Table 7: Statewide FWQG Effectiveness - Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	1,302	<1	78	17	3	1	<1
State	213	0	80	20	<1	0	0
All Sites	1,515	<1	79	19	2	<1	<1

Table 8: Statewide FWQG Effectiveness - Number of Impacts

Ownership	# Rated Practices	Minor/ Temporary (4)	Minor/ Prolonged (3)	Major/ Temporary (2)	Major/ Prolonged (1)
Private	1,302	454	76	28	22
State	213	84	2	0	0
Total	1,515	538	78	28	22

Explanation

Overall, adequate protection of forest, soil and water resources was achieved 79% of the time (Table 7). Collectively, 666 departures (44%) occurred across all ownerships, with the majority being minor and temporary impacts. Of the 1,515 rated practices, 538 were minor and temporary impacts (36%) and 78 major and prolonged impacts (5%) associated with FWQG effectiveness. Major impacts (temporary or prolonged) accounted for less than 2% of the impacts across the state.

FWQG Application for Each Forest Management Activity

Table 9 describes the relative degree of FWQG application for each of the forest management activities rated at each harvesting site across all ownerships.

Table 9: Forest Management Activity - FWQG Application

Forest Management Activity	# Rated Practices	FWQG Application - Percent (%) Practices Rated			
		Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Streamside Mgm't Zone (SMZ)	71	92	6	1	1
Roads (planning)	168	79	17	4	0
Roads (construction)	152	64	24	12	0
Roads (maintenance)	130	81	17	1	1
Stream Crossings	70	86	14	0	0
Skid Trails	226	77	17	6	0
Landings	164	89	9	2	0
Timber Harvesting	270	83	11	6	1
Site Prep, Regen. & Reveg.	128	78	18	4	0
Chemical Mgm't	30	90	7	3	0
Prescribed Fire	68	94	6	0	0
Forested Wetlands	38	89	11	0	0

Explanation

The majority of rated practices (78%) were associated with road related activities - planning, construction, maintenance - stream crossings, skid trails and landings and timber harvesting. Activities associated with chemical management and forested wetlands were the fewest rated practices.

Results by Area - FWQG Application and Effectiveness

Tables 10 and 11 display FWQG application and effectiveness results by each of the Division's geographic areas for all FWQG across all ownerships.

Table 10: FWQG Application by Administrative Area

Area	# Practices Rated	FWQG Application - Percent (%) Practices Rated			
		Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Bear River	29	38	45	17	--
Wasatch Front	159	79	15	6	--
Northeast	350	74	14	11	1
Central	--	--	--	--	--
Southeast	899	86	13	1	--
Southwest	78	82	18	--	--

Table 11: FWQG Effectiveness by Administrative Area

Area	# Practices Rated	FWQG Effectiveness - Percent (%) Practices Rated					
		Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Bear River	29	--	45	28	17	10	--
Wasatch Front	159	--	70	19	5	0.6	6
Northeast	350	--	65	27	7	0.5	--
Central	--	--	--	--	--	--	--
Southeast	899	--	85	14	0.1	0.8	0.2
Southwest	78	3	82	15	--	--	--

Explanation

Upon examination, few strong conclusions can be made from the preceding information which is largely due to the relatively small number of practices rated in some instances. For example, only 29 FWQG practices (1 audit) were rated in the Bear River Area, and only 78 FWQG practices (4 audits) were rated in the Southwest Area. And while there were no FWQG practices (0 audits) rated in the Central Area, there are several active operations occurring. Hence, it is an unfair assumption to conclude that the FWQG aren't being applied nor being effective at minimizing non-point source pollution in these areas.



Photo 2: Properly constructed logging road.

Similarly, it is unfair to conclude that FWQG application and effectiveness in the Wasatch Front Area - where the FWQG are providing adequate protection to forest, soil and water resources 70% of the time - are being applied to any lesser degree as in the Southeast Area (85%). In other words, there is no great disparity in the findings between each of the areas.

Application and Effectiveness of Specific FWQG

Practices associated with roads (planning, construction & maintenance), skid trails and landings and timber harvesting accounted for the majority of rated practices. Combined, there were a total of 1,110 rated practices (73%) for these activities.

Roads

Roads accounted for 41% of the rated practices. There are seventeen (17) specific FWQG practices associated with roads. A total of 450 FWQG practices were rated across all ownerships statewide (Table 12).

Table 12: FWQG Practices - Roads

	Ownership		
FWQG	State	Private	Total
Planning for Roads	27	141	168
Road Construction	25	127	152
Road Maintenance	24	106	130
Total	76	374	450

Taken as a whole, Tables 13 and 14 show statewide FWQG application and effectiveness rating for roads, which includes planning, construction and maintenance. In this instance, FWQG application was met or exceeded 75% of the time with a corresponding effectiveness rating of 69%.

Table 13: Statewide FWQG Application (Roads) - Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	374	75	19	6	<1
State	76	75	20	5	--
All Sites	450	75	19	6	<1

Table 14: Statewide FWQG Effectiveness (Roads) - Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	374	--	68	24	5	<1	2
State	76	--	73	27	--	--	--
All Sites	450	--	69	25	4	<1	1

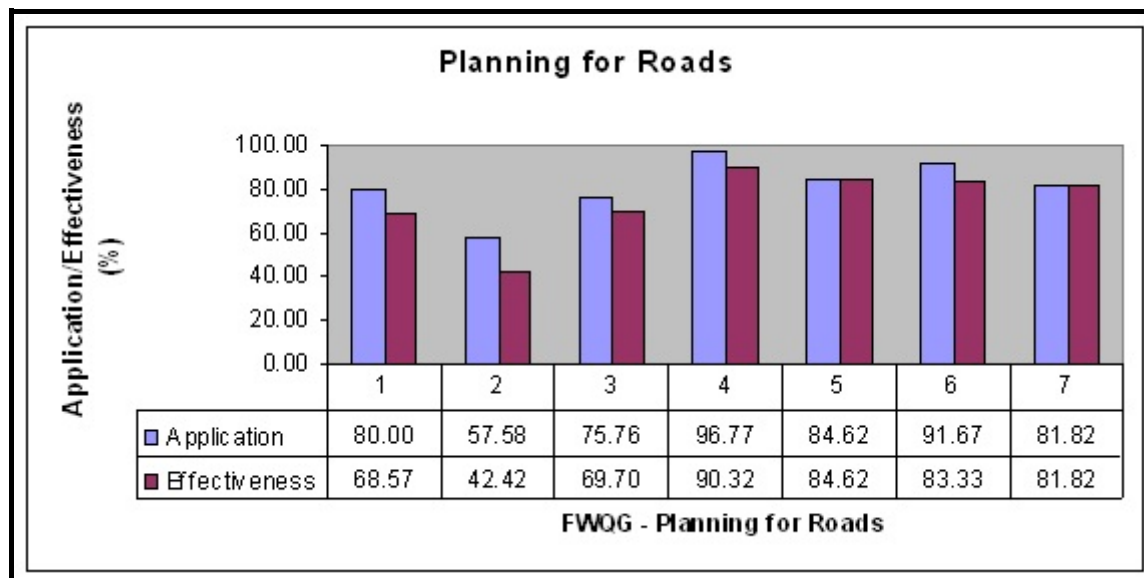
Planning for Roads

More specifically, of the 17 FWQG practices associated with roads, seven are directly related to planning for roads. Results show an average compliance rating (application rating 4 and 5) of 81%. Figure 1 displays results of the specific FWQG rated in this category for both FWQG application and effectiveness. In this case, FWQG 4 and 6 had the highest ratings - 97% and 92%, respectively. These FWQG refer to constructing roads in unstable areas and selecting the most appropriate stream crossing. FWQG 2 - road location and design; drainage - was rated the lowest at 58%.

Forest Water Quality Guideline (Planning for Roads)

1. Plan roads to fit within transportation networks, and that fit the natural terrain as much as possible. Minimize road construction, cuts, fills and the number of roads within the harvest area.
2. Locate and design roads upslope of natural drainages to allow road surfaces to drain. Road surface slope should utilize natural drainage as much as possible. Design cross culverts, ditches, dips, water bars to direct water off road surface.
3. Avoid sustained excessive grades of 10-20%.
4. Avoid road construction in unstable areas.
5. Minimize the number of stream crossings. Cross streams at right angles to reduce sedimentation and debris from entering the stream.
6. Select the most appropriate stream crossing (ford, culvert, bridge).
7. Design stream crossings to handle peak runoff and flood waters.

Figure 1: FWQG Application/Effectiveness - Planning for Roads



Road Construction

Of the 17 FWQG practices associated with roads, five are specific to road construction. Results show an average compliance rating (application 4 and 5) of 64%. Figure 2 displays results of the specific FWQG rated in this category. FWQG 1 which deals with limiting road construction activities during wet periods or when the ground is frozen represented the highest application rating of 88%. FWQG 3 referring to adequate drainage from the road surface was rated the lowest at 48%.

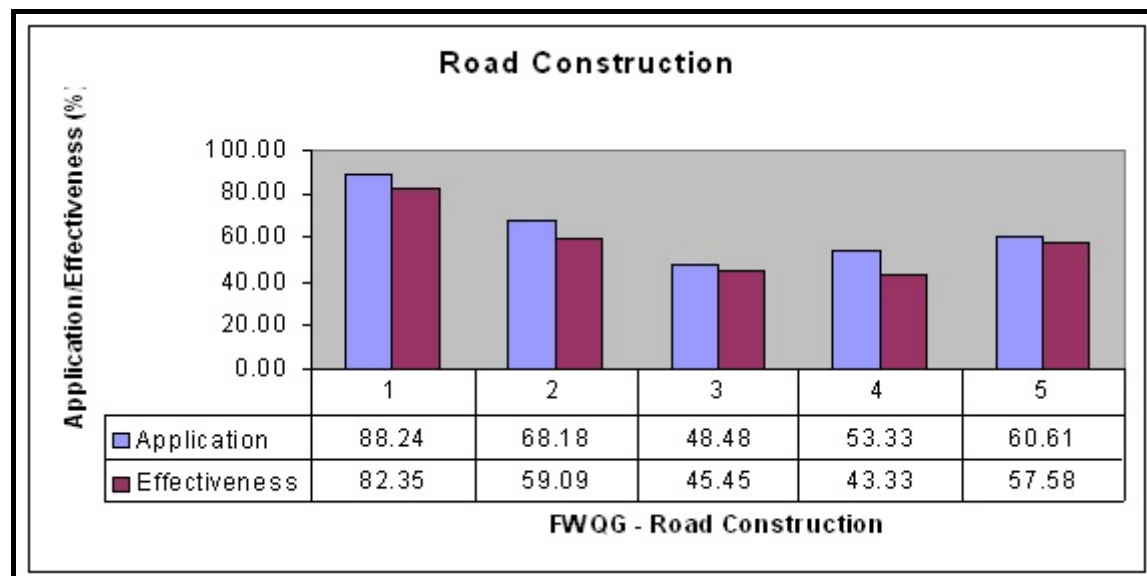


Photo 3: Road failure due to poor construction.

Forest Water Quality Guideline (Road Construction)

1. Limit road construction activities during periods of excessive moisture or frozen ground.
2. Roads constructed to prevent excess material (debris, soil) from entering stream.
3. Road constructed to provide adequate drainage from the road surface with appropriate features to reduce erosion.
4. Dips, water bars and culverts are constructed to effectively provide surface flow off the road.
5. Avoid constructing berms that may channel water down the road.

Figure 2: FWQG Application/Effectiveness - Road Construction



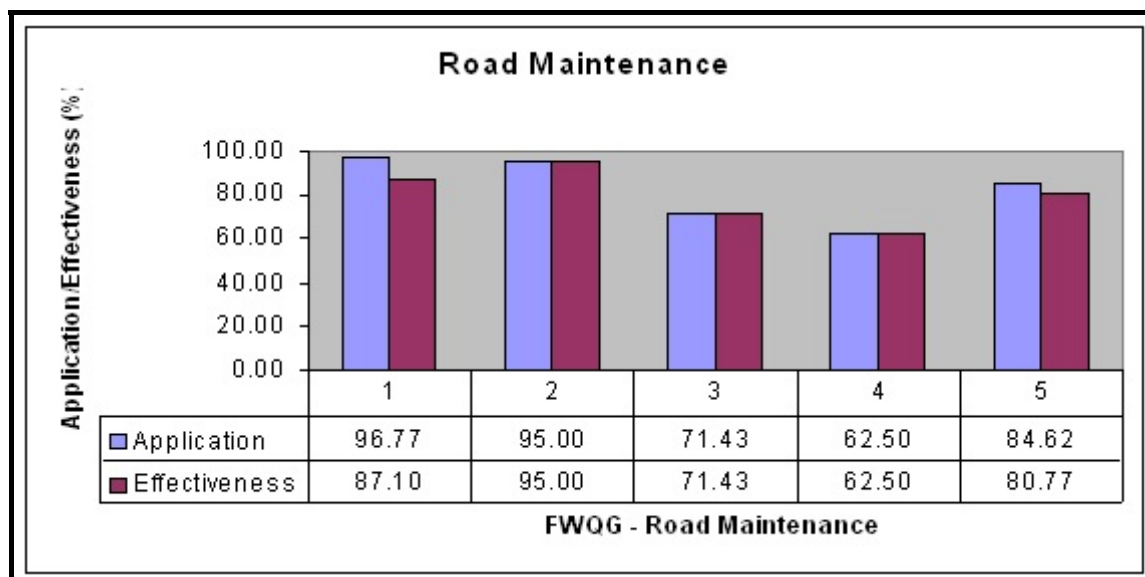
Road Maintenance

Of the 17 FWQG practices associated with roads, five are specific to road maintenance. Results show an average compliance rating (application 4 and 5) of 82%. Figure 3 displays results of the specific FWQG rated in this category. FWQG 1 and 2 represented the highest ratings of 97% and 95%, respectively. These FWQG refer to the avoidance of road maintenance unless necessary. FWQG 4 - avoid using roads during wet periods - was rated the lowest at 63%.

Forest Water Quality Guideline (Road Maintenance)

1. Avoid grading unless maintenance is necessary. Unnecessary grading creates additional source of sediment.
2. Avoid cutting the toe-slope when grading roads or pulling ditches.
3. Avoid placing side-cast material, soil and gravel into streams, SMZ's or other water bodies. Excess material produced from grading should be feathered out or hauled away.
4. Avoid using roads during wet periods.
5. Erosion control features are periodically inspected and maintained.

Figure 3: FWQG Application/Effectiveness - Road Maintenance



Skid Trails and Landings

Skid trails and landings accounted for 35% of the rated practices. There are twelve (12) specific FWQG practices associated with skid trails and landings. A total of 390 FWQG practices were rated across all ownerships statewide (Table 15).

Table 15: FWQG Practices - Skid Trails and Landings

	Ownership		
FWQG	State	Private	Total
Skid Trails	38	188	226
Landings	26	138	164
Total	64	326	390

On the whole, Tables 16 and 17 show statewide FWQG application and effectiveness rating for skid trails and landings. In this instance, FWQG application was met or exceeded 82% of the time with a corresponding effectiveness rating of 80%.

**Table 16: Statewide FWQG Application (Skid Trails and Landings)
Percent (%) Practices Rated**

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	326	83	13	4	--
State	64	84	12	4	--
All Sites	390	82	13	4	--

**Table 17: Statewide FWQG Effectiveness (Skid Trails and Landings)
Percent (%) Practices Rated**

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	326	--	77	18	2	1	<1
State	64	--	84	16	--	--	--
All Sites	390	--	80	17	2	1	<1

Skid Trails

Of the 12 FWQG practices associated with skid trails and landings, seven are specific to skid trails. Results show an average compliance rating (application rating 4 and 5) of 78%. Figure 4 displays results of the specific FWQG rated in this category. FWQG 6 had the highest rating of 88%. FWQG 5 - use of appropriate water diversion devices to control erosion - was rated the lowest at 63%.

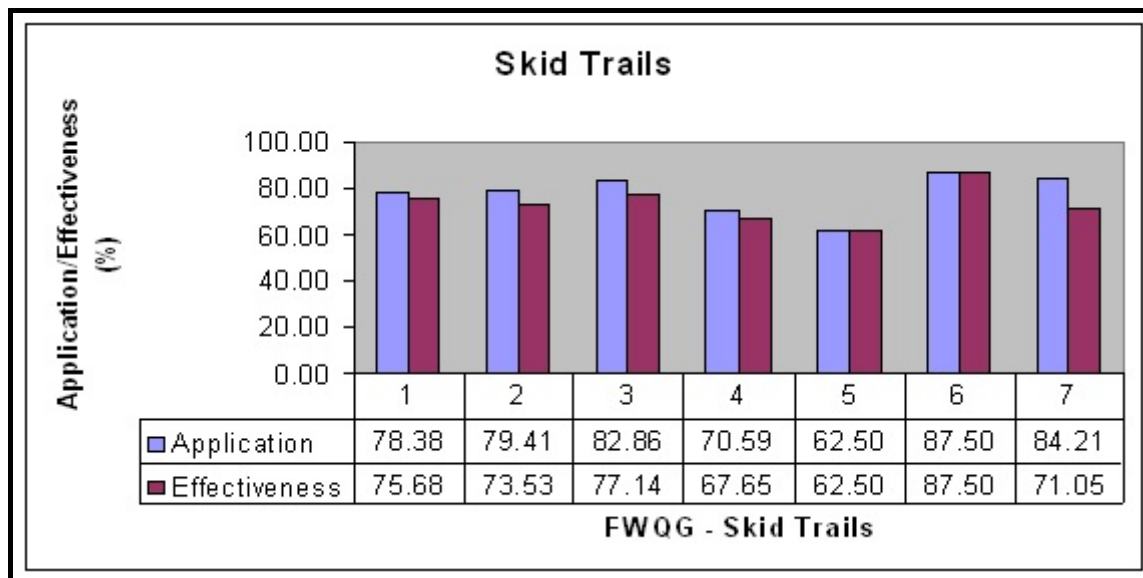


Photo 4: Evaluating skid trail construction and location.

Forest Water Quality Guideline (Skid Trails)

1. Skid trails and skidding operations designed and located to minimize soil disturbance.
2. Avoid skidding directly up and down steep slopes for long distances.
3. Skid trails located away from natural drainage systems. Avoid concentrating runoff and limit grad where possible.
4. Minimize skidding during wet periods to limit soil displacement and compaction.
5. Appropriate water diversion devices installed to prevent channelization and erosion on skid trails.
6. Locate skid trails outside SMZ's.
7. Utilize appropriate skidding method commensurate with soil and topography.

Figure 4: FWQG Application/Effectiveness - Skid Trails



Landings

Of the 12 FWQG practices associated with skid trails and landings, five are specific to landings. Results show an average compliance rating (application rating 4 and 5) of 89%. Figure 5 displays results of the specific FWQG rated in this category. With the exception of FWQG 5, results were relatively comparable across the board. The low rating for FWQG 5 suggests that little attention was given to restoring landings to pre-harvest conditions.

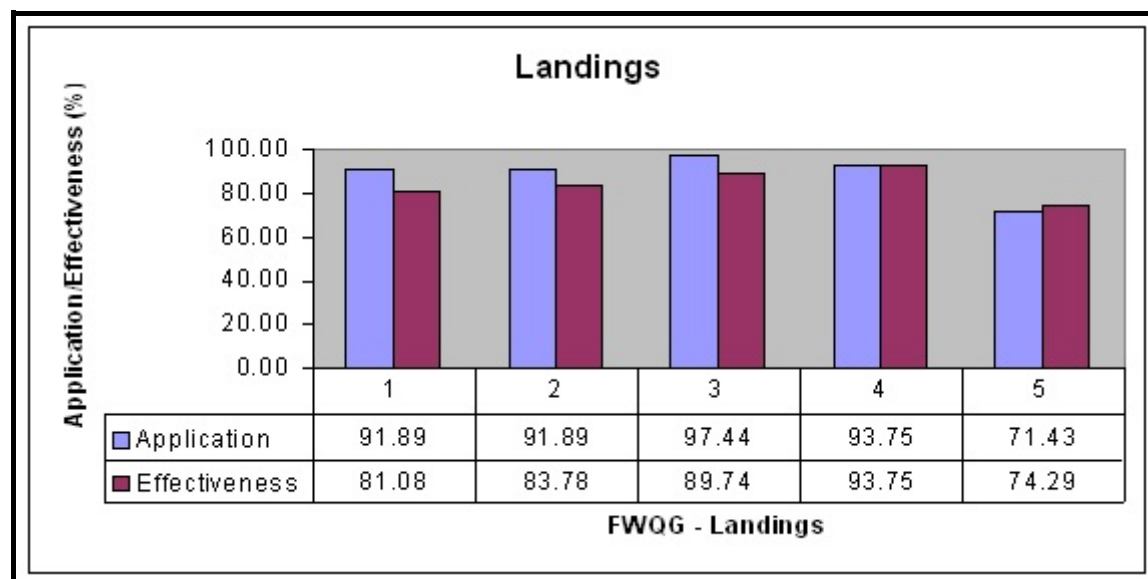


Photo 5: Landing site re-contoured and re-seeded.

Forest Water Quality Guideline (Landings)

1. Landings located away from natural drainage systems and divert runoff to areas where vegetation can serve as a filter. For proper drainage, landings should be constructed with 3 to 10% slopes.
2. Locate landings to avoid skidding down and across drainage bottoms.
3. Minimize number and size of landings.
4. Landings should be located outside SMZ's.
5. Upon termination of operations, landings should be re-contoured, re-vegetated and returned to a natural condition.

Figure 5: FWQG Application/Effectiveness - Landings



Timber Harvesting

Timber harvesting accounted for 24% of the rated practices. There are nine (9) specific FWQG practices associated with timber harvesting. A total of 270 FWQG practices were rated across all ownerships statewide (Table 18).



Photo 6: Timber harvesting activity.

Table 18: FWQG Practices - Timber Harvesting

FWQG	Ownership		Total
	State	Private	
Timber Harvesting	40	230	270
Total	40	230	270

On the whole, Tables 19 and 20 show statewide FWQG application and effectiveness rating for timber harvesting. In this instance, FWQG application was met or exceeded 85% of the time with a corresponding effectiveness rating of 84%. Figure 6 displays results of the specific FWQG rated in this category.

Table 19: Statewide FWQG Application (Timber Harvesting)
Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	230	83	11	6	<1
State	40	87	8	5	--
All Sites	270	85	9	5	<1

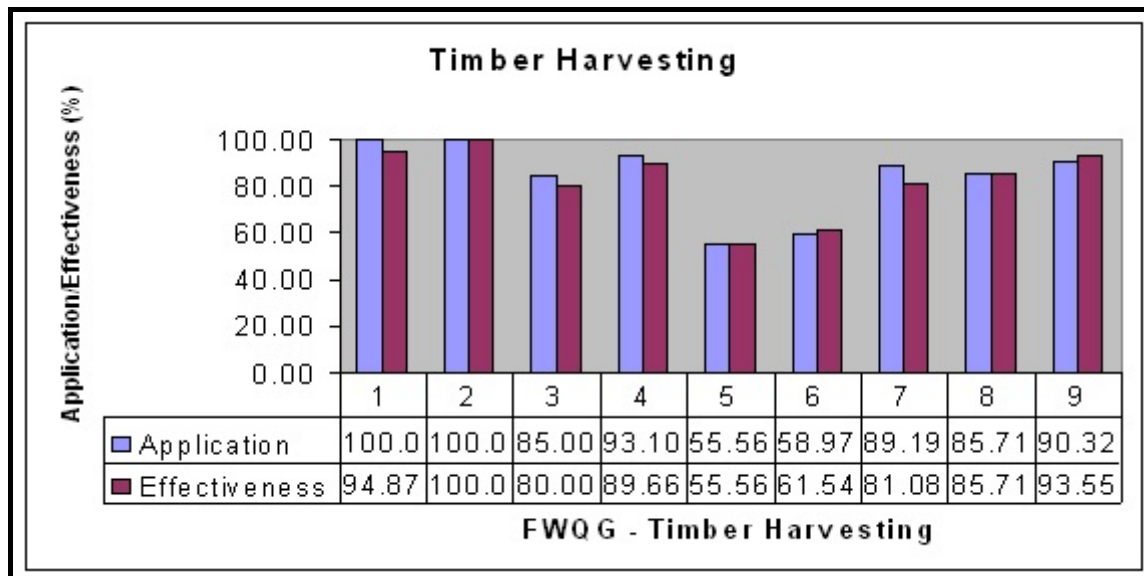
Table 20: Statewide FWQG Effectiveness (Timber Harvesting)
Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	230	<1	80	15	3	2	<1
State	40	--	88	13	--	--	--
All Sites	270	<1	84	14	3	2	<1

Forest Water Quality Guideline (Timber Harvesting)

1. Avoid excess soil compaction.
2. Avoid the use of ground-based equipment within the SMZ. Trees harvested in the SMZ should be end-lined or winched.
3. Utilize harvesting system best suited to topography to avoid excessive compaction, damage to residual stand and ensure adequate regeneration and re-vegetation.
4. When descending steep slopes, avoid the use of skidder blades for braking purposes.
5. Adequate road and skid trail drainage structures installed prior to commencement of operations.
6. Minimize slash accumulations and prevent excessive waste of resources by adhering to pre-determined utilization standards.
7. Reduce or minimize the amount of soil in slash piles by using brush blades for piling.
8. Avoid piling and burning slash in SMZ's.
9. Locate skid trails to minimize damage to regeneration.

Figure 6: FWQG Application/Effectiveness - Timber Harvesting



CONCLUSIONS

Utah's forest and water resources are among its most valuable assets. Successful implementation of environmental protection programs have made great strides in minimizing non-point source pollution while improving water quality throughout the state. With forest management activities the most concerning non-point source pollutant is sediment, particularly from activities related to roads. Carefully applied, implementation of Utah's FWQG - which promote the protection of water quality - serves an important function in maintaining this valuable resource.

Overall results indicate Utah's FWQG are being applied at a relatively high rate and providing adequate protection to forest, soil and water resources. While not completely effective, careful use and application of the FWQG can dramatically reduce water quality impacts. Results also suggest there are areas where FWQG application and effectiveness could be improved. Other states with comparable monitoring processes continually show compliance results ranging between 95% and 98%. Whereas this report provides baseline data for Utah's FWQG Monitoring Program, much of the success by other states is due to years of continued monitoring and continuing education for loggers, landowners and resource managers. With this report, Utah's benchmark has been established, and is now in a position to build upon its success to continue implementing an effective FWQG Monitoring Program that can remain voluntary in combination with existing policies, continuing education and training.

Utah's FWQG Monitoring Program will continue to rely heavily on operator compliance with the Utah Forest Practices Act - Notification of Intent to Conduct Forest Practices requirement. While the number of NOI received has gradually increased over the past three years, the Division is concerned about the declining level of compliance with the FPA - Notification of Intent requirement. Effective monitoring of the FWQG cannot proceed without the confidence of knowing where timber harvesting activities are occurring or to what degree the FWQG are being implemented. Consequently, describing future results and trends toward improving FWQG implementation will be difficult.

The FWQG monitoring process has proved to be a positive and productive approach to dealing with a complex issue. FWQG audits provide a mechanism for identifying and documenting important forest management issues which are directly related to sustaining the productive capacity of Utah's forests while continuing to provide abundant, clean water to Utah's citizenry. Continued support and involvement of key stakeholder groups is necessary to make Utah's FWQG Monitoring Program more effective and practical with subsequent monitoring efforts.

RECOMMENDATIONS

This report provides benchmark information on FWQG application and effectiveness. The following recommendations focus on suggested improvements for continued FWQG monitoring.

General

- Increase involvement of loggers, landowners and foresters involved in forest practices administration to join the monitoring teams during field audits. This will help them understand the FWQG and augment important information exchange.
- Extend training and education of loggers, landowners and resource managers based on problem areas identified in the audit process. This will ensure expectations for applying FWQG standards are met.

Planning for Roads

- Avoid sustained excessive grades of 10-20%. Clarify the term “excessive.” If roads are constructed correctly, a road at this grade would be appropriate.
- Further clarification is needed during the audit process to account for pre-existing roads that may have been reconstructed or used as is.
- Determine audit process for pre-existing and poorly located roads.
- Provide further guidance for road surface drainage on roads that are being used for different purposes.

Road Maintenance

- Avoid cutting the toe of cut slopes when grading roads or pulling ditches. Consideration of slope as an issue if below the angle of repose.

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APPENDIX A

UTAH'S FOREST WATER QUALITY GUIDELINES



Pre-harvest Planning

Pre-harvest planning is the design of timber harvest operations to meet landowner objectives.

Application Practices

1. Contact or consultation with a professional forester. When site conditions dictate, other resource professionals should be consulted.
2. Have a forest management plan, forest stewardship plan, timber harvest plan, prescribed burning plan or other appropriate plan prepared. Include a list of specific Forest Water Quality Guidelines applicable to the site and the proposed activities.
3. Locate environmentally sensitive areas utilizing field observations, aerial photographs, topographic maps and other available maps and resources. This may include areas such as streams, wetlands, lakes, unstable soil areas, special plant and wildlife areas and steep slopes.
4. Locate and mark streamside management zones (SMZ). Streamside management zones should be located in the field and managed according to site specific needs. Any stream crossings should carefully located and disturbance within the SMZ should be minimized (see Streamside Management Zone).
5. Choose the appropriate harvest prescription such as thinning (even or uneven aged), shelterwood, seedtree, clearcut, etc., to achieve objectives and provide for desired future conditions.
6. Identify the appropriate harvesting system such as a rubber tired skidder, crawler, skyline and cable system, mechanical harvesting or helicopter for the existing and desired site conditions.
7. Plan the road layout. A carefully planned road system will provide for post-harvest access if desired, decrease sediment, reduce soil disturbance and allow for a more efficient harvest.
8. Locate log landings, haul roads, and major skid trails prior to start of any work.

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9. Establish and designate vehicle and machinery maintenance areas. These areas should be limited in number and located to prevent contamination of streams and wetlands by petroleum products and other chemicals.
 10. The location of logging camps should be carefully chosen to avoid adverse impacts to sensitive areas from human activities.
 11. Plan for the treatment of slash, closure of roads and forest regeneration prior to harvesting.
 12. Plan to conduct operations using a legally binding document that specifies what is to be harvested, slash disposal, site reclamation and the utilization of water quality protection measures. Consider the inclusion of contract guarantees such as performance bonds or provisions. Additionally, landowners should consider including provisions specific for their protection.
 13. Obtain all necessary permits and approvals prior to initiation of activities.

Streamside Management Zone

The Streamside Management Zone (SMZ) is an area or strip of land adjacent to a stream or other body of water where management practices (e.g., harvesting of timber, road construction, prescribed burning, etc.) are designed to protect water quality, aquatic wildlife and wildlife habitat. The trees and vegetation within the SMZ serve as a natural filter to keep sediment out of a stream, reduce soil erosion and act as a buffer to protect the stream from degradation caused by nearby activities. The SMZ is **not** a zone of exclusion where all silvicultural activities are precluded but, because of its values, the SMZ is an area where management activities should be closely managed.

Classification categories used in determining a SMZ are:

Class I Streams: or other bodies of water used for domestic water supply and/or the spawning, rearing, migration of fish, including impacted streams with recovery potential for a fishery. Also included are perennial streams that contribute significant flow to downstream fisheries.

Class II Streams: All streams that do not meet the Class I definition and are identifiable in the field as having a defined channel bed of bed rock, sand, gravel, or rocky material, definite banks, generally having an ordinary high water mark and confines and conducts continuously or intermittently flowing water. Also included are reservoirs, lakes, and ponds greater than 1/10th of an acre that do not support fish or provide domestic water supply.

Application Practices

1. Designate the SMZ in the harvesting area based on the Stream Class and the percent of slope adjacent to the stream. Use the following zone distances.

Stream Class I: Recommended minimum slope distance from the ordinary high water marks on each side of the stream is 75 feet.

Stream Class II: Recommended minimum slope distance from the ordinary high water marks on each side of the stream is 35 feet.

In addition, the zone width should be increased in the following areas:

The width of the SMZ should be extended to include: 1) wetlands adjacent to the stream channel and 2) wetlands intercepted by the prescribed SMZ boundary (see Forest Wetlands).

Where slopes adjacent to the stream are greater than 35%, it is recommended that the SMZ include the area encompassed by the following minimum slope distances on each side of the ordinary high water mark:

- Stream Class I: 100 feet
- Stream Class II: 50 feet

2. Establish an “undisturbed strip of at least 15 feet slope distance on either side of the stream beginning at the ordinary high water mark. In this zone there would be no disturbance to vegetation or soil to maintain sufficient ground cover to trap sediment and to protect root mass for bank stability.
3. Trees are important to a healthy SMZ. Leave hardwoods, unmerchantable conifers and shrubs for bank stabilization and as a future source of large woody debris to the stream channel. Along perennial streams, it may be desirable to leave selected, healthy, merchantable trees and promote the retention of long lived species.
4. Shading requirements may dictate independent criteria for tree retention. Leave sufficient trees and shrubs to provide adequate shade for stream.
5. Clearly mark the SMZ boundary with flagging, paint or signs to ensure that equipment operators and tree cutters have no question about the boundary.
6. Minimize disturbances that expose mineral soil on the forest floor in the streamside management zone.
7. Avoid clear cutting (removing all or most of the trees) in the SMZ. Clearly mark those trees to be harvested in the SMZ.
8. When trees are removed from the SMZ, it is recommended that a diversity of tree species and age classes are maintained unless management goals state some different requirement.
9. In the SMZ, leave an adequate number of mature trees to avoid potential regeneration problems.
10. Maintain or provide sufficient ground cover and understory in the SMZ to trap sediment.

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11. Directional felling or use of a boom feller-buncher is recommended for harvesting operations in the SMZ or wetlands. Cable-assisted felling techniques can reduce loss to breakage and further protect the SMZ. Keep slash (tree tops, branches) from entering streams, lakes or other bodies of water. Avoid felling trees in streams or bodies of water. Limbing of trees should be done above the high-water mark of the channel.
 12. Avoid driving heavy equipment and skidders in SMZ. Utilize end-lining skidding technique to remove trees from the SMZ. When absolutely necessary, operate equipment only during frozen or dry ground conditions in SMZ.
 13. Restrict mechanical site preparation in the SMZ. Encourage natural revegetation, seeding, and hand planting in SMZ.
 14. All new or reconstructed roads, landings, portable sawmills, camps, skid trails, and fire lines should be located on stable areas outside the SMZ. Stream crossings and fire lines may be an exception when carefully implemented.
 15. At all road crossings of Class I and II streams, structures should be sized to allow for full surface flow of the stream throughout the entire life of the structure. Design of stream crossing should be based on how long the structure is expected to be in place, acceptable risk level and downstream resources. Consider 50 year - 24 hour design peak flows for permanent structures. All structures for Class I streams should be designed and constructed to allow unrestricted fish passage (see stream crossing guideline in Road, Trails, Landings and Stream Crossings).
 16. Plan stream crossings to avoid indiscriminate crossings. Cross stream at right angle (perpendicular) to channel. Minimize number of stream crossings to reduce bank impacts, sedimentation, and debris from entering the stream.
 17. Do not side-cast soil or gravel into a stream, wetland or watercourse during road construction, grading or maintenance.
 18. Wheeled or tracked equipment should not operate within the stream channel, draws, or the SMZ except on established roads. Do not skid down stream channels and draws.
 19. Avoid the introduction of slash into the SMZ from adjacent areas. Avoid piling and burning slash in the SMZ (see Prescribed Fire).

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20. Carefully control skid patterns to avoid on-site and downstream channel damage, buildup of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and the SMZ. Use end-lining to winch logs directly (shortest distance) out of the SMZ.
 21. Any material which inadvertently or accidentally enters a stream course in an amount which adversely affects the natural flow, water quality, or fishery resource, should be removed in a manner which causes the least disturbance. Logging debris, especially small limbs and needles, that can reduce oxygen levels in the water are of particular concern. However, some large material (large organic debris) can be essential for long term channel stability.
 22. Excavated material removed from stream courses as a result of necessary construction should be moved to an upland area and stabilized where it will not be washed back to the stream during runoff. Short term stockpiles should be bermed and stabilized with mulch, erosion netting or erosion mats as necessary. If practical, permanent piles should be shaped to minimize sideslopes and contoured to blend with existing topography. Permanent piles should also be promptly stabilized using revegetation techniques.
 23. Avoid broadcast burning (allowing fire to spread through an area) in the SMZ unless planned and identified as the proper management treatment (see Prescribed Fire).
 24. Do not handle, store, apply, or dispose of hazardous or toxic materials (fuels, pesticides and herbicides) in a manner that could pollute the stream or wetlands or causes damage or injury to humans, lands, animals, or plants. Limit pesticide and fertilizer use in the SMZ unless labeled for such use. Establish a buffer for pesticide application along all flowing streams (See Chemical Management).
 25. Do not mix or clean equipment or containers used for mixing or application of fuels, pesticides or herbicides near streams, bodies of water or in the SMZ (see Chemical Management).

Roads, Skid Trails, Landings and Stream Crossings

A **road** is a course of travel used for forest access. It may be used primarily or only occasionally for transportation of forest products. Roads may be either permanent or constructed in a manner intended to be temporary.

Skid trails are those areas used for the temporary transport of logs either by skidding or vehicle transport. These areas are usually excavated or denuded of vegetation by the repetitive use of a particular corridor.

Landings are those areas cleared of vegetation and sometimes excavated to facilitate the orderly stacking, decking, loading or bunching of logs in preparation for transport. Landings may include areas where logs are limbed and bucked if those areas are different from the areas where logs are decked or loaded.

Application Practices - Planning for Roads

1. Plan roads to fit within transportation networks and minimize road construction. Keep the number of roads to be built at a minimum. Bear in mind the impact upon visual quality of numerous roads. Provide standards to allow construction of roads which maintain forest productivity as well as protect water quality and fish and wildlife habitat.
2. Roads should be planned with safety in mind. Plan for road construction to the required standards for the intended purpose. Keep the roads no wider than necessary for safety and the intended use to minimize the disturbed area. Match the standards of road construction to the local site, terrain, soil conditions and topography as well as expected size of vehicle use.
3. Plan road location to avoid wetland areas where feasible. Temporary or permanent forest roads for silvicultural operations may be constructed without regulation by section 404 of the Clean Water Act if the 15 federally mandated Best Management Practices (BMPs) cited within the Concerns and Implications section of the Forest Wetland FWQG are implemented (see pg. 91). However, failure to utilize these BMPs or a future non-silvicultural use of the road to be constructed will require that a section 404 permit be applied for from the U.S. Army Corps of Engineers. Non-silvicultural uses include land conversion from forest to agricultural, residential/recreational development or other uses.
4. Plan roads which fit the natural terrain as much as possible. Minimize cuts and fills and where necessary, balance required fills with the amount of material to be excavated.

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5. Locate roads upslope of natural drainages to allow road surfaces to drain.
 6. Plan roads to avoid sustained excessive grades (10% to 20%).
 7. Design road surface slope to utilize natural drainage (i.e., insloping, outsloping or changing of the grade).
 8. Locate placement of dips, water bars and changes of road alignment to direct water off road surface. Use an appropriate number and spacing of dips and water bars based on grade of the road and soil types.
 9. Design cross culverts or ditches to complement natural drainage for protection of the road surface, excavation or embankment.
 - a. Locate cross culverts where fill erosion will be minimized and direct discharge into streams will be prevented.
 - b. Road drainage structures should be spaced so peak flows between the features will not exceed the capacity of the individual drainage structures or result in excessive erosion of ditches and roadbeds.
 10. Identify geologically stable areas to place excess excavated material.
 11. Identify unstable areas and avoid road construction in these areas, if possible. An example might be where rock layers slant with the slope, rather than into the slope and represent potential for mass movement of rock and dirt. Obtain expert advice in these areas.
 12. Plan stream crossings to avoid indiscriminate crossings. Cross stream at right angle (perpendicular) to channel and design approaches to prevent sediment transport onto roadfill. Minimize number of stream crossings to reduce bank impacts, sedimentation, and debris from entering the stream. Avoid more than one crossing point for the area harvested, if possible.
 13. Design crossings to handle peak runoff and flood waters, minimize impact on water quality and provide adequate fish passage where appropriate. Design of stream crossing should be based on how long the structure is expected to be in place, acceptable risk level, and downstream resources. Generally, use of the 25 yr. - 24 hr. storm event for temporary road crossings and the 50 yr. - 24 hr. storm event for permanent road crossing will provide

adequate structure sizing. Remember stream crossings may require a stream alteration permit from the Utah Division of Water Rights.

14. Select the most appropriate feature for stream crossings,(i.e. fords, culverts or bridges) considering the following criteria: stream size, impact on aquatic resources, cost, maintenance requirements, permanence of crossing, stream banks and soil conditions of approaches.
- a. Fords may be the least expensive alternative if conditions allow. Limited traffic, type of stream bed, weight of vehicles using ford and season of use should all be considered when contemplating a ford stream crossing. Fords may be the most practical alternative in areas prone to flash floods. Fords do, however, cause continued disturbance to the stream bed. If a culvert or bridge is not practical, locate fords on stable, rocky portions of the stream channel. Fords may be improved to reduce stream bed damage by the use of such items as concrete planks or other similar materials. Fords should be considered as temporary crossings with low frequency of use. Use particular care to prevent the stream from being diverted onto the road surface by the ford.
 - b. Culverts are the most common stream crossing structure. They are relatively inexpensive, allow use of native fill material and can be quickly installed. Permanent culverts should be of sufficient size for runoff (see # 13 above) and at least 15 inches in diameter, even those used for seeps, springs, wet areas and cross ditches. Culverts larger than 6 feet in diameter should be designed by an engineer or stream hydrologist. Fish passage should be provided for all Class I streams and other live streams as needed. Removal of temporary culverts requires excavation of fill material, extraction of the culvert and stabilization of the stream banks.
 - c. Bridges usually have less impact on water quality and fisheries. Bridges are especially appropriate when crossing large streams or when debris is a problem. While usually more expensive, bridges can be permanent or temporary. Temporary bridges are easily placed and removed, relatively inexpensive, provide excellent stream protection, and usually require minimal stream bank rehabilitation. In addition, they can be reused.

Application Practices - Road Construction

1. Time road construction activities to limit operations during periods of excessive moisture or frozen ground.
2. Install road drainage at time of construction. Roads should be constructed in such a manner that debris, overburden and excess material are kept from entering streams. Drainage ways should be kept free from such material.
3. All road fills should be compacted to settle the fill material and reduce water entry into the fill. Snow, ice, frozen soil and woody debris should not be buried in fills. This could lead to development of voids in the fill and may lead to subsequent failure of the road. This is particularly important near streams.
4. Use rip rap, vegetative material, down spouts or similar devices to reduce erosion on fills.
5. If possible, maintain live trees and shrubs at the base of fill slopes to serve as sediment filters.
6. Construct slash windrows at the toe of fill slopes on stream crossings (upstream and downstream) to act as a filter and prevent sediment from entering streams.
7. Where potential for sediment delivery to a channel exists, construct slash windrows at outlets of relief culverts, cross drains, water bars, rolling dips and at the toe of fill slopes.
8. Construct roads to provide adequate drainage from the road surface by using outsloped or insloped roads with the appropriate ancillary features to reduce erosion.
 - a. Outsloped roads allow water to drain off the road in a low-energy flow but require fill to be stable. This type of road is not appropriate in proximity to streams and must be evaluated for safety reasons.
 - b. Insloped roads require a drainage ditch on the inside of the road to carry the water away from the cut bank and roadside. The gradient of such ditches must be carefully constructed. Ditch gradients of 2 to 6 percent are steep enough to keep collected water moving but not so steep that excessive erosion occurs. These ditches must then be allowed to drain away from the road at appropriate intervals along the road. This drainage may be accomplished by culverts, dips, water bars or cross drains.

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9. Dips and water bars are constructed to effectively provide surface flow off the road. They should be built so that traffic does not obliterate them. Construction should be such that the proper drainage is provided but no driving hazard is created. The cross grade should be 2 or 3 percent at 90 degrees to the road centerline to minimize vehicle stress. Dips are usually the most economical way to provide cross road drainage.
 10. Culverts are sometimes used to provide ditch relief for insloped roads. Culverts should be skewed 15 to 30 degrees toward the inflow of the ditch to optimize inlet efficiency and reduce maintenance problems. Protect the upstream end from plugging by armoring with rock or the use of drop inlets, boxes or screens (if appropriate). If possible, install these culverts at the gradient of the original ground slope. If not, the culvert outlets should be armored with rocks, logs or other material to dissipate the energy of the emerging water.
 11. Avoid constructing a berm that may channel water down the road.
 12. As soon as practical following construction, road cuts, fills and associated disturbed areas, should be stabilized and/or revegetated (e.g. backslope cut slopes as needed for stability). Natural revegetation may be adequate to stabilize these areas, however, seeding, hydro mulching or other revegetation may be necessary.
 13. Surfacing of long term or permanent roads may be advantageous. This type of treatment includes graveling, covering with road base, chipping or pavement. Advantages of such treatment include less maintenance required, less transport of sediment, less road damage in wet periods and the extension of operating seasons.
 14. Surfacing or other such treatment of short term roads on highly erodible areas such as switch backs and short sections of steep grades or other sensitive areas (e.g. stream crossings) reduces the opportunity for erosion and should be considered.

Application Practices - Stream Crossings

1. Construction activities should be timed to minimize impact to water quality. Usually this is late summer when water flows are minimal. However, thunderstorm activity and fisheries must be considered. Stream crossings should be emplaced as quickly as possible to limit adverse impacts. De-watering of sites by diversion through temporary culverts or the use of hose should be considered when installing culverts.
2. Use fords when appropriate. See section on fords under road planning. Fords require rocky stream beds or some type of armor plating to protect the bed.

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3. To function properly, culverts should be aligned with the natural stream channel. This alignment is critical. Any deflection from the stream channel will cause bank erosion. Culverts which are skewed are also more prone to plugging by debris.
 4. Culverts should be placed slightly below the grade of the natural stream. This will avoid culvert outfall which could cause erosion of the stream bed or bank at either the intake or outlet of the culvert.
 5. The bed for the culvert should be of the same slope as the natural stream channel and should be of rock-free soil or gravel. This will allow the even distribution of the load over the full length of the culvert.
 6. The original channel of the stream should not be altered upstream from the culvert unless necessary to prevent blockage or protect the fill.
 7. Compact the fill material around the culvert as backfill occurs. This will prevent seepage and failure of the culvert. The backfill material should be of finer materials and free of voids. Culverts should be covered with at least one foot of compacted fill material for culverts up to 36 inches in diameter and one third of their diameter for larger culverts.
 8. Consider using trash racks or inlet grates where debris in catch basin may threaten the structure.
 9. Protect culvert inlet and outlet against erosion by providing rock armor, logs, grass seeding or other suitable material. Observe the water flow in a newly-placed culvert and determine any need for additional armoring.
 10. Compact and grade the approaches to a culvert to maintain a consistent road grade.
 11. Temporary bridges require firm soil banks. Some cribbing may be necessary to provide additional support for the stream bank. Approaches can be constructed that will not create any sediment. Railway cars and wooden structures are sometimes used effectively for portable, temporary bridges.
 12. As soon as practical upon completion of use, temporary stream crossings need to be removed, excess fill material excavated and deposited in a stable area, banks rehabilitated and bed of the stream restored to its original grade. In some instances it may be necessary to remove temporary crossings prior to the spring runoff.

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13. Permanent bridges require solid foundations such as bedrock, or concrete abutments and should be engineered for the appropriate size, span and material of construction. Obtain expert advice for the design and installation.

Application Practices - Road Maintenance

1. Grade roads only as often as needed to maintain a stable road surface and to retain the surface drainage. Avoid grading any section of a road unless maintenance is required. Unnecessary grading just creates a source of sediment from the newly disturbed surface.
2. Avoid cutting the toe of cut slopes when grading roads or pulling ditches. Clean ditches only when needed.
3. If grading produces excess material, feather it out or haul it away. Avoid side-casting material into streams. If large amounts of excess material exist, haul them to safe disposal sites which are stabilized to prevent erosion. Avoid locations near streams where erosion will carry materials into a stream.
4. Retain the appropriate inslope or outslope of the road. Avoid leaving a berm that channels water down the road.
5. To reduce maintenance, avoid using roads during wet periods if such use will damage the road or negate the effects of the erosion control features.
6. Reduce dust by use of water, rock or other appropriate road treatments.
7. Maintain erosion control features by periodic inspection and maintenance. Inspections should be conducted following heavy storms. Maintenance may include cleaning dips and cross drains, repairing ditches, cleaning culvert inlets and cleaning culvert trash racks or inlet grates.
8. Upon completion of forestry activities, examine the actual need for continued road use and erosional stability. In a timely manner, close all roads that are unstable, erodible or may not be necessary.
 - a. Block access to discourage vehicular access.
 - b. Remove structures and restore approximate natural drainage.

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- c. Install water bars and broad based dips at appropriate intervals.
 - d. Scarify and revegetate where natural revegetation is inadequate.

Application Practices - Skid Trails

1. Design and locate skid trails and skidding operations to minimize soil disturbance. The use of designated skid trails is one way of limiting soil compaction and site disturbance.
2. In designing skidding methods and trails, consider longer skidding routes which will reduce disturbance due to temporary road construction. Usually, roads cause more soil disturbance and opportunity for erosion than skid trails.
3. Use a skidding method such as a cable system, rubber tired skidder, tractor, fellerbuncher or other equipment which is appropriate for the soil and terrain. Cable systems can be used on steeper slopes. Uphill skidding produces skid trails that diverge and spread water. Downhill skidding methods tend to create skid trails that converge and concentrate runoff downhill. Soils which are highly erosive, saturated, easily compacted or geologically unstable are situations which warrant careful consideration when selecting a skidding system and identifying constraints on the skidding.
4. Avoid skidding directly up and down steep slopes for long distances. If tractor skidding steep slopes consider excavating skid trails across the slope and winching to the trail. Cable yarding downhill may require additional measures (such as slash deposition) to prevent excessive erosion.
5. Locate skid trails away from natural drainage systems, avoid concentrating runoff and limit grade where possible.
6. Limit skidding during wet periods to minimize soil displacement and compaction.
7. Upon cessation of skidding operations, if the slope of an area is sufficient to cause concern, install appropriate water diversion devices such as cross ditches or water bars in skid trails to prevent channelization and erosion.
8. Seed or use slash to mulch exposed soils where erosion may become a problem due to slope, soils or other site-specific situations.
9. Skid trails should be located outside Streamside Management Zones (SMZ).

Application Practices - Landings

1. If possible, construct or locate landings with 3 to 10 percent slopes for proper drainage.
2. Locate landings away from natural drainage systems and divert runoff to areas where vegetation can serve as a filter.
3. When locating landings, avoid areas where skidding down and across drainage bottoms to the landing may be a problem.
4. Minimize the number and size of landings yet still accommodate a safe, economical operation. However on steep slopes, more numerous and smaller landings along roads reduce the need for extensive excavations. Consider skidding as loading occurs to minimize landing size.
5. Landings should be located outside Streamside Management Zones (SMZ) and at a sufficient distance to preclude future encroachment into the SMZ.
6. Upon termination of operations, recontour landings to the extent practical, treat excessive compaction and revegetate where natural revegetation is inadequate.

Application Practices - Winter Operations

1. Winter weather allows opportunity for low impact logging and even operations impractical in other seasons of the year in some sensitive areas such as wet meadows, high water table areas or other areas of soil erosion or compaction hazard.
2. Construct roads during warmer months to prevent frozen material being used in road fills or use compacted snow for roads or trails in sensitive areas. Roads of compacted snow may also be used for single-entry harvests or temporary roads.
3. Provide adequate surface and cross drainage for all roads before the winter season occurs.
4. Locate and mark existing culverts. Mark in such a manner that location will be visible even in deep snow and storm conditions.
5. Keep all drainages open and culverts unplugged.
6. Begin operations after ground is frozen or snow cover is adequate to prevent damage (usually 15 inches or more).

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7. During cold weather, plow snow cover off roadway to facilitate deep freezing of the road grade leaving 2" to 3" of compacted snow to protect road surface. This provides tremendous strength but excessive or deep snow cover must be kept from road surface.
 8. Plow away snow berm or provide breaks in snow berm to allow road drainage particularly as the spring thaw occurs.
 9. Suspend operations when weather conditions change and preclude activity. For example, hauling should be limited to colder portions of the day since road surfaces deteriorate rapidly when thawing occurs.
 10. When alternate freezing and thawing occur, snow cover should be kept on the roads to prevent thawing during the warmer periods.
 11. Remove temporary stream crossings prior to spring runoff.

Timber Harvesting

Timber harvesting is the cutting and removal of trees for wood products or the cutting of trees to accomplish forest management objectives.

Application Practices - Harvesting Equipment

1. Layout skid trails prior to harvesting.
2. Utilize directional felling techniques.
3. Consider the use of mechanical harvesters and delimbers that may reduce soil compaction.
4. Exclude the use of ground based machinery within the streamside management zone. Trees to be harvested within the SMZ should be end lined or harvested utilizing a boom feller-buncher.
5. Limit whole tree skidding where excessive damage may occur to the residual stand.
6. Utilize cable harvesting systems or helicopter logging on steep slopes (generally in excess of 40%) where the use of wheeled or tracked machinery could cause excessive soil disturbance.
7. Choose the appropriate sized equipment that can adequately perform the operation required, minimize soil disturbance and compaction with the least damage to any residual stands.
8. Consider the use of low ground pressure equipment (floatation tires or tracked) on wetland areas.
9. Avoid the use of skidder blades for braking when descending steep slopes.
10. Consider use of animals or specialized equipment for skidding where site conditions warrant.
11. Avoid excessive soil compaction.

Application Practices - Winter Logging

1. Install adequate road or skid trail drainage prior to start of activities or the summer prior to harvesting.
2. Clearly mark culverts and other drainage structures to be visible in deep snow and keep all drainages open and culverts unplugged.
3. Compact skid trails in snow prior to skidding.
4. Prepare for thawing and expect temporary shut-downs.
5. Avoid road construction during winter months.
6. Consider harvesting wetlands and other sensitive areas during the winter months utilizing snow roads and snow skid trails.

Application Practices - Slash Management (see Prescribed Fire)

1. The need to burn slash may be reduced by lopping, crushing, scattering, chipping or adherence to pre-determined utilization standards. Alternative uses of substandard merchantable material (e.g. firewood, fence stays, etc.) may also reduce the necessity of burning slash.
2. Slash can sometimes be cut in such a manner as to leave all branches and foliage within a foot or two of the ground. Slash treated in this manner, unless excessive in overall quantities, can be left to impede surface water flow, aid nutrient recycling and to provide protection for reproduction.
3. Minimal amounts of slash can sometimes be crushed by skidding equipment thereby making piling and burning unnecessary. This can be done efficiently if operators are instructed to do so during skidding operations.
4. Sometimes firewood or other products can be sold or given away from areas where concentrations of slash exist. However, some supervision may be necessary to prevent scattering of piled slash which may reduce or eliminate the opportunity for efficient burning of the piles.
5. Use brush blades for the piling of slash to reduce the amount of soil in slash piles.

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6. Retain small slash and brush for nutrient recycling, shade and soil retention.
 7. Avoid piling of slash within the SMZ for disposal or burning.
 8. Utilized prescribed fire according to a burn plan prepared by a knowledgeable fire professional and in accordance with laws and administrative rules.
 9. Ensure best possible utilization to prevent excessive slash accumulations and waste of resources.
 10. Select appropriate slash disposal treatment that minimize water quality impacts and reduce risk of insect infestations.

Application Practices - Regeneration

1. Retain a sufficient number of healthy trees with adequate crowns and good form for seedtrees or retention trees during seedtree, selection, shelterwood and thinning operations.
2. Scarify the soil only to the amount necessary to meet regeneration objectives.
3. Limit soil compaction or treat excessively compacted soil to obtain adequate regeneration or revegetation.
4. Locate skid trails to minimize damage to regeneration.
5. Avoid running equipment over advanced regeneration except were desired to thin or change composition. Consider end lining felled trees out of advanced regeneration.

Site Preparation, Regeneration and Revegetation

Site preparation is the use of mechanical, chemical or other means to prepare a site for regeneration of a forest. Regeneration is the reestablishment of a forest stand or the re-stocking of a residual forest. Revegetation may include regeneration, however it additionally covers the need for soil stabilization by the use of herbaceous plants especially on log landings, skid trails, roads and within streamside management zones.

Application Practices - General Guidelines

1. Utilize pre-harvest planning that addresses the harvesting method (thinning, shelterwood, single and group tree selection, patch clearcutting, clearcutting, etc.) in regard to regeneration.
2. Consult with a forester in the planning and decision making process prior to signing contracts or harvesting timber.
3. Choose appropriate equipment for the harvest of timber on sensitive areas, including wetlands, bogs, slide areas and steep slopes. Selection should consider effects of erosion, compaction, sedimentation of waterbodies, soil displacement and minimization of soil disturbance.
4. Close trails, roads and landings upon completion of harvest or when use is no longer desired.
5. Reduce the opportunity for invasion of noxious weeds by prompt revegetation with appropriate seed.
6. Install water diversion devices where needed to limit the erosion potential.

Application Practices - Site Preparation

1. Ensure slash disposal and treatment to prepare site for regeneration through use of fire and/or mechanical means.
2. Create optimal conditions for the regeneration on the site or within the residual stand through the use of fire, mechanical or chemical means.
3. Plan prescribed burning to accomplish objectives without causing excessive damage to soil or the residual stand.
4. Scarify soil only to the amount required by the species desired for regeneration.
5. Consider chemical site preparation instead of mechanical site preparation where possible to reduce soil disturbance.

Application Practices - Regeneration

1. Retain healthy trees of desired species, with sufficient crowns and good form for seed trees or retention trees during seedtree, shelterwood and thinning operations to provide quality regeneration from genetically superior seed sources.
2. Retain stocking levels suited to site moisture conditions. Dry sites or southern aspects may require retention of some trees to provide shade for regeneration. Shade will reduce soil moisture loss and reduce temperatures providing better conditions for regeneration.
3. Plant proper species for soil and site conditions when using artificial regeneration.
4. Use local seed source stock during artificial regeneration projects where possible.
5. Monitor regeneration survival and take necessary measures to promote the long term survival of regeneration that protects water quality and meets the landowners stocking objectives.

Application Practices - Revegetation

1. As soon as practical following construction of road cuts, fills and associated disturbed areas, these areas should be revegetated and/or stabilized. Natural revegetation may be adequate. If not, revegetation should be augmented by seeding, hydro mulching or other means. Upon termination of operations, landings should be recontoured to the extent practical and revegetated.
2. Stabilize exposed soil (including firelines) with proper seed mixtures for soil and site conditions. Minimize the use of fertilizers to amend the soil.
3. On steep slopes the use of straw mulch or logging slash may be needed to stabilize soil until establishment of grasses.
4. Following removal of temporary culverts and bridges, establish earth or straw dikes on stream banks and seed with proper seed mixtures.
5. Utilize a native herbaceous seed mixture suited to site conditions. Avoid seeding herbaceous vegetation where tree seedling establishment is desired unless erosive conditions warrant. Slash may be used to reduce erosiveness.

Chemical Management

Chemical management refers to the use of chemicals such as pesticides (herbicides, rodenticide, insecticides, fungicides, etc.), petrochemicals (oil, gasoline, diesel), antifreeze, fire retardants and fertilizers for forest management.

Application Practices - General Guidelines

1. Have a contingency plan to follow in the event of a chemical spill. This plan should include who to contact in the event of a spill and may include having absorbent or neutralizing materials on hand with literature that describes spill cleanup or containment procedures.
2. Transport and store chemicals in leak-proof, labeled containers.
3. Chemical storage containers and facilities should be located outside the SMZ.
4. Use impervious dikes or berms around storage tanks with a capacity adequate to contain the entire volume of the tank according to local regulations.
5. When possible mix chemicals and clean equipment only in areas that are part of the application site.

Application Practices - Pesticides

1. Follow label instructions, EPA guidelines, and state law when using pesticides. Use pesticide for target species according to label instructions.
2. Restricted-use pesticides should only be applied under the supervision of persons who are properly trained and licensed. Such pesticides pose considerable risk to persons and the environment if used improperly.
3. Apply chemicals during appropriate weather and season. The biology of a pest normally determines the time of year when it can be controlled, and attempted control at other times is unlikely to be effective. Other weather factors that should be considered include wind that can cause chemical drift, extreme heat that can cause chemical volatilization and drift, humidity, and precipitation. Always follow label instructions.
4. Avoid aerial or broadcast application of pesticides in SMZs unless chemical is specifically labeled for application over or near water. Utilize spot treatments where appropriate in an SMZ. Herbicide treatments in an SMZ should be done in a manner to avoid killing large amounts of vegetation.

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5. Consider chemical site preparation instead of mechanical where possible to reduce sedimentation and other adverse impacts to water quality.
 6. Pesticides should not be applied to surface waters directly, by drift, or by washing into water, unless labeled for such use.
 7. Do not mix chemicals or clean equipment or containers in or near streams, water bodies or streamside management zones.
 8. Mix the appropriate amount of pesticide needed. Dispose of excess pesticides according to label instructions and existing regulations.
 9. Transport, store and apply pesticides using leakproof, labeled containers. Dispose of pesticide containers in an approved landfill or according to label instructions.
 10. Prevent chemical backflow (siphoning) into the water source by using an air gap or reservoir between the water supply hose and mixing tank.
 11. Inspect and service equipment frequently, paying particular attention to seals, hoses and calibration of metering equipment.
 12. Keep records of the chemical used, amounts or rates, date applied, where used, weather or site conditions at the time of use and results.
 13. Ensure pesticide use is warranted and use the least amount and lowest toxicity that will achieve desired control. Consider biological, cultural, manual and preventative means to reduce amounts of chemicals applied (use IPM - Integrated Pest Management).

Application Practices - Petrochemicals and Antifreeze

1. Do not drain used oil, fuel, or antifreeze onto ground. Dispose of properly at an approved disposal station.
2. Fuel and service equipment away from SMZs and avoid spillage.
3. Keep all fuel, oil, and antifreeze away from surface waters and away from areas where spilled material may enter or be washed into water.
4. Do not apply used oil on road surfaces for dust control.

Application Practices - Other Considerations

1. Minimize use of fertilizers. Limit fertilizer applications in SMZs. Fertilizer use should be based on indication of need from a soil test or plant symptoms.
2. Avoid aerial fire retardant and foam drops within streamside management zones.
3. Avoid locating retardant mixing and filling stations within the SMZ.

Prescribed Fire

Prescribed fire is the use of fire as a management tool for a specified purpose when conducted under specific conditions to attain the stated objective without unduly damaging or jeopardizing soil, existing desirable vegetation and water quality.

Application Practices - Prescribed burning or In Place (*In situ*) burns (may include broadcast burns)

1. A prescribed burn plan should be prepared by a qualified professional prior to any burning.
2. Burns should not be conducted within a streamside management zone or in proximity to perennial streams, lakes or reservoirs unless specifically required by a management objective.
3. Response of vegetation to fire should be forecast by knowledgeable persons to ensure expected outcome is consistent with the management objectives.
4. Weather conditions and fuel moisture content should be specified for a burn to accomplish the intended purpose and yet avoid excessive damage to the existing vegetation and soil. Soil moisture should be optimal to reduce impact of burn to residual desirable vegetation and micro flora and fauna.
5. Total consumption or kill of target species is usually not necessary for a burn to be successful.
6. Ignition should be conducted in a manner to accomplish the purpose of the burn yet minimize the impact of resultant heat to the site.
7. Precautions should be taken which are necessary to ensure control of a fire at all times or to limit the risk of fire escaping an area intended for burning. If a wildfire occurs and control of the wildfire dictates fire line construction, these guidelines should also be implemented.
 - a. If fire lines are necessary, they should be constructed along contours as much as possible. When erosion could become a problem, control measures should be taken to minimize soil loss. These measures include but are not limited to the installation of water bars, spreader ditches and the reseeding of disturbed areas susceptible to erosion (see Revegetation guideline in Road, Trails, Landings and Stream Crossings).

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- b. If weather conditions and the burn warrant, fire suppression forces such as engines or crews should be kept available to respond if needed.
8. A contingency plan should be prepared to identify appropriate actions to be taken if a prescribed fire exceeds control parameters (area, size, flame lengths or rate of spread).
 9. Personnel experienced and qualified in fire management techniques should plan and conduct burns, provide supervision or be asked to provide technical expertise to conduct a safe, efficient, minimal impact burn.

Application Practices - Burning of slash

1. The decision to burn slash should be made judiciously. Other alternatives exist which may accomplish the same purpose.
 - a. The need to burn slash may be reduced by lopping, crushing, chipping or adherence to pre-determined utilization standards. Alternative uses of substandard merchantable material (e.g. firewood, fence stays, etc.) may also reduce the necessity of burning slash.
 - b. Slash can sometimes be cut in such a manner as to leave all branches and foliage within a foot or two of the ground. Slash treated in this manner, unless excessive in overall quantities, can be left to impede surface water flow, aid nutrient recycling and to provide protection for reproduction.
 - c. Minimal amounts of slash can sometimes be crushed by skidding equipment thereby making piling and burning unnecessary. This can be done efficiently if operators are instructed to do so during skidding operations.
 - d. Sometimes firewood or other products can be sold or given away from areas where concentrations of slash exist. However, some supervision may be necessary to prevent scattering of piled slash which may reduce or eliminate the opportunity for efficient burning of the piles.
2. A prescribed burn plan should be prepared by a qualified professional prior to any burning.
3. Pile and burn or burn only that slash necessary to abate the problem for which the burning will be done. Some slash left on a area will provide protection and nutrients for the regeneration while excessive removal of slash will cause soil compaction, higher soil temperatures and increase soil erosion.

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4. Avoid introduction of slash into the Streamside Management Zone (SMZ) from adjacent areas.
 5. When appropriate, whole length tree skidding with delimbing and bucking done at landings may concentrate slash in limited areas. Slash is much easier to treat when concentrated in such a manner. In addition, any damage done to the soil by subsequent burning is more limited in size of area affected.
 6. Conduct slash piling operations only when soils are frozen or dry enough to minimize compaction and displacement.
 7. Slash piled for burning should be sufficiently free from dirt and other unburnable material as to allow efficient burning and piles that do not burn clean shall be further treated to abate the problem caused by such slash.
 - a. Use brush blades on dozers when piling slash. Avoid the use of dozers with angle blades.
 - b. Slash piles should be large enough to generate sufficient heat when burned to consume the accumulated debris.
 8. Burns of piles should not be conducted within a streamside management zone or in proximity to perennial streams, lakes, reservoirs or intermittent drainages.
 9. Slash on moderately steep slopes may be more appropriately burned without being piled since use of dozers on these steeper slopes may initiate erosion waterways.
 10. Very steep slopes may preclude burning if erosion would result. Erosive soils would also warrant special consideration.

Forested Wetlands

Wetlands, as defined in federal regulations and laws are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Forested wetlands are wetland areas that are covered by or surrounded by trees or forests.

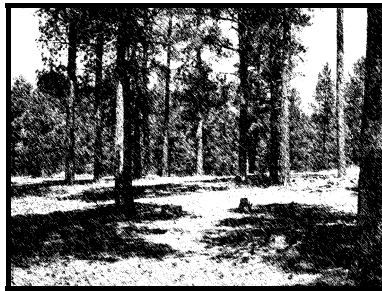
Application Practices

1. Avoid locating roads, trails and landings in wetlands.
2. Utilize mats or other similar devices to disperse loads when crossing wetland areas.
3. Conduct harvest activities in wetlands when the ground is frozen, covered with snow or during extended dry periods.
4. Locate, identify, and mark wetlands prior to the start of any forestry operations.
5. Keep open water free from slash.
6. Use only pesticides labeled for use in wetlands.
7. Do not fuel or service equipment in wetlands.
8. Avoid equipment operation in areas of open water, seeps and springs.
9. Utilize low ground pressure equipment (floatation tires or tracked) as necessary to minimize rutting and compaction.
10. Provide adequate cross-road drainage to minimize changes to natural surface and subsurface wetland flows.
11. Avoid creation of ruts in wetlands. Where possible skid around wetlands or endline felled trees out of wetland areas. Utilize slash or mats to reduce rutting when skidding through wetlands is necessary.
12. Avoid skidding through open wetland meadows and big game wallows.

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13. Where possible divert runoff from roads, trails and landings to upland areas above wetlands to reduce silting of wetland areas.
 14. Minimize soil disturbance and compaction in wetlands during the treatment of slash.

APPENDIX B

PROCEDURES FOR CONDUCTING FWQG AUDITS



PROCEDURES FOR CONDUCTING FOREST WATER QUALITY GUIDELINES AUDITS



Utah Department of Natural Resources
Division of Forestry, Fire and State Lands

Introduction

Forests are an important natural resource in the state of Utah providing significant contributions to the state's quality and way of life. Findings from the 1996 Utah Forest Practices Task Force indicate that timber harvesting on Utah's non-federal lands has increased in recent years. This trend is expected to continue as population and wood product demand continues to increase and supply from federally-owned lands decreases. Conducted improperly, timber harvesting sometimes leads to land degradation. The negative impacts of poor timber harvesting can include soil erosion, sedimentation and decline in water quality.

Since the 1970s, non-regulatory Forestry Best Management Practices (BMPs) have provided guidance as minimum water quality protection standards for forestry operations. In 1987 Congress amended the Clean Water Act and added Section 319 to address non-point sources of pollution. Section 319 directed all States to develop non-point source pollution plans to address pollution of this nature.

Utah's Non-point Source Management Plan (1988) describes BMPs and narrates the importance of an ongoing maintenance and monitoring effort:

"BMPs may be defined as methods, measures or combination of measures that are determined by an agency after problem assessment to meet its non-point source pollution control needs. They include, but are not limited to, structural and nonstructural controls, and operation and maintenance procedures."

"Best Management Practices cannot be viewed in isolation. They must be seen as a management strategy, an approach, or a system. Seldom is one practice sufficient to resolve a non-point source problem. A combination of practices is usually required along with a management philosophy of commitment to reducing non-point source pollution. It is rarely sufficient to install a practice and forget it. BMPs and systems require an ongoing maintenance and management effort which must be recognized at the outset."

The 1998 Silviculture Addendum uses Forest Water Quality Guidelines (FWQGs) as the basic management practice and serves as the cornerstone for protecting forest resources and water quality:

"Forest Water Quality Guidelines are a collection of voluntary field applicable practices for use during forestry activities to protect water quality adopted by the State and contained within the Non-Point Source Management Plan."

Properly applied, the FWQGs can minimize non-point source pollution produced from timber harvesting activities.

The 2001 Utah Legislature passed the Utah Forest Practices Act (FPA) (Chapter 65A-8a) which requires operators to register with and notify the Division of Forestry, Fire and State Lands of intent to conduct forest practices. The FPA also provides direction to the division to promote the implementation of the FWQGs by providing technical assistance and education to landowners and operators. The registration requirement provides a mechanism which identifies who is operating in Utah. The notification requirement provides the means of identifying where forestry activities are occurring in the state. Under this law, information about the FWQGs is sent to both landowners and operators.

Implementation of the FWQGs is administered within a non-regulatory framework, and is largely dependent upon the forest products industry taking a lead role in this effort. The forest products industry in Utah should realize the present and long-term benefits of implementing the FWQGs voluntarily. The FWQGs are designed to provide the best protection to water quality and aquatic resources during the management of forest resources, including timber harvesting. It is expected that forest industry within Utah follow the lead of industry in other states and utilize the guidelines in a voluntary, self-policing fashion to provide water quality protection while providing forest products to consumers. Acceptance and implementation of the FWQGs may forestall or preclude the need for future regulation of timber harvesting.

Monitoring is the cornerstone of the FWQGs. Since the FWQGs are recognized by state and federal legislation as an acceptable method to control non-point source pollution, it makes sense to check the application and effectiveness of the FWQGs as part of such a program. Implementation or compliance monitoring is a widely used and accepted method of evaluating forest practices, and serves as a surrogate for quantitative water quality monitoring. Generally, monitoring forest practices includes on-site, field review of harvested sites. Utah will use a qualitative implementation approach through performance reviews or “audits” to determine if the FWQGs are being applied and whether they are effective at minimizing erosion and sedimentation.

Quantitative water quality monitoring is a long-term and expensive endeavor. Water quality varies naturally due to variable geology, land forms, soils, and climatic events. Due to this variability, investigators must collect large numbers of samples over a long period of time to accurately characterize water quality. States are increasingly relying on qualitative surveys, using interdisciplinary teams to assess forest practices on-site and to monitor silvicultural non-point source pollution control programs.

Program Goals, Objectives and Strategy

From the division's perspective, the goals and objectives of the FWQG Monitoring Program (FWQGMP) are two-fold:

- Develop, coordinate and implement a forest water quality monitoring and evaluation program identified in Utah's Non-point Source Management Plan for Silvicultural Activities, and;
- Demonstrate the application of the FWQGs as being effective in reducing non-point source pollution and protecting soil and water resources.

As a means to achieve the goals of the FWQGMP, the following objectives have been identified:

- Through a field review process, determine if the FWQGs are being applied during timber harvesting operations. This is the process of systematically gathering information to determine whether the FWQGs are being applied and applied in the intended manner. This addresses the subject of FWQG implementation.
- Through a field review process, assess the relative effectiveness of the FWQGs at reducing non-point source pollution related to timber harvesting activities. This is the process of information gathering and evaluating whether the application of the FWQGs achieves the anticipated or desired resource protection. This addresses the subject of FWQG effectiveness.
- Identify and provide a feedback mechanism on the need to revise, clarify or strengthen the FWQGs.

Monitoring Approach and Strategy

Within the context of the FPA recognizing the need to promote the implementation of the FWQGs before, during and after the conduct of forest practices, there is a tacit approval from the state legislature body to establish and conduct non-point source water pollution monitoring related to silvicultural activities.

Previously, monitoring efforts were hampered by the division's inability to identify and locate where forest management activities were occurring on the landscape. Through the Notification of Intent (NOI) requirement of the FPA, the division now has a mechanism that provides a point of contact and location of forest practices.

Cooperation among landowners and other participating entities is crucial to the overall effectiveness of the FWQGMP. It should be thought of in terms of an assessment or evaluation rather than something designed to bring about enforcement actions. Due to the qualitative nature of the FWQGMP, monitoring forest practices should be conducted in the relative sense as opposed to absolute quantification. For example, the intent of the program is not to determine how much sediment is entering a stream. Rather, the focus is on determining if there is soil movement, whether sediment is entering a stream and, if so, its potential or actual relative impact on water quality. Monitoring will target harvesting activities occurring on private forest lands and state-owned forest lands throughout Utah.

Statewide monitoring efforts will incorporate a combined, two-phased approach to carry out the FWQGMP - continuous and periodic. The continuous monitoring is referred to as Phase I. The periodic monitoring is referred to as Phase II.

Phase I - Continuous (on-going) Post-Harvest Field Review

Monitoring is a long-term process. Initially, the FWQGMP will serve as a point of reference for future decision making and programmatic refinements. The long-term monitoring endeavor will be linked to the division's landowner assistance programs. As part of its statutory charge, the division provides a balanced program of technology transfer, assistance, and education to Utah's non-federal landowners within a non-regulatory framework. Direction provided by the FPA strengthens the division's ability to carry out this function.

Successful conduct of Phase I monitoring will require a strong cooperative relationship between division's Technical Assistance & Consultation (TAC) and Program Delivery (PD) work units. Data collection will utilize a field-based method designed to focus on assessing both the application and effectiveness of applicable FWQGs. The intent of Phase I monitoring is to conduct on-site, post-harvest reviews for all timber harvesting activities occurring on state and private lands in the state. Assuming access is allowed, each site will be given a post-harvest evaluation by not less than a two-person assessment team and will include the Area Manager or Area Forester from the respective administrative area and the Forest Stewardship Coordinator or his designee. The team will gather information which will be used to evaluate FWQG application and effectiveness. Conducting this phase of the monitoring program should be considered as routine follow-up with landowners and be incorporated into the division's normal operating procedure.

Phase II - Periodic (biennial) Post-Harvest Field Review

The second phase of the FWQGMP will implement periodic (biennial) evaluations on a selection of sites previously evaluated under Phase I. The sites selected for Phase II will meet specific selection criteria. Periodic post-harvest field reviews will be done through an interdisciplinary (ID) team approach.

FWQG Audit Process

Overview

The FWQGMP will depend largely on operator compliance with the FPA NOI requirement and willingness of landowners to allow monitoring on their property. The notification will be the primary mechanism enabling the division to establish a point of contact with the landowner and operator, identify where the forestry activity is occurring and make available technical assistance services to the landowner before, during and after the conduct of forestry activities.

Phase I Monitoring

Notifications submitted to the division shall be acknowledged by the forest stewardship coordinator or designee within ten days of receipt. The acknowledgment shall include information on the forest water quality guidelines and any other information the division believes would assist the landowner and operator with the conduct of forest practices. Landowners will be encouraged to contact the area office for assistance.

If a landowner does not contact the area office, the division will initiate follow-up action subsequent to receipt of an NOI. A letter requesting permission to enter the property to conduct inspections and post-harvest review will be sent to the landowner by the area office within 14 days after receipt of an NOI. Upon receipt of written confirmation from the landowner, the division will schedule time necessary for conducting inspections and reviews. Depending upon the level of rapport with a landowner, the requirement for written communication may be waived by an Area Manager or Area Forester.

If the landowner does not respond to the letter requesting permission to enter the property to conduct inspections and a post-harvest review, the area office will attempt to contact the landowner by phone. If this is unsuccessful, a final request will be sent via certified mail with return receipt. Standard text for the final letter will be prepared by the forest stewardship coordinator. If the landowner does not respond to the final request, the division will consider permission to enter the property to have been denied. A TSIR documenting this determination will be sent to the forest stewardship coordinator.

Ideally, the process of conducting Phase I FWQG Monitoring will include a minimum of three site visits: a pre-operational inspection; an in-progress inspection; and a post harvest audit.

Pre-Operation Inspection

The first site visit is a pre-operational inspection and will occur before the harvesting activity begins. The purpose of the pre-operational inspection is to discuss the proposed forest practice(s) and applicable FWQGs with the landowner and operator, explain the reasoning for monitoring and for the Area Forester to become familiar with the harvest site. The intent of this visit is to convey to the landowner and operator the value of using the FWQGs. The FWQGs are designed to provide the best protection for forest, soil and water resources during timber harvesting activities. A Timber Sale Inspection Report (TSIR) should be completed at the end of the pre-operation inspection.

In-Progress Inspection

The second site visit will occur during the harvest activity at which time another TSIR will be completed. During the in-progress inspection, particular attention will be given to any potential problems arising as a result of misapplication of applicable FWQGs and recommendations for corrective action(s). The TSIR will document special concerns related to FWQG implementation to be taken into account during Phase I audits. Any obvious misapplication of FWQGs will be reported to, or discussed with, the landowner and operator. Hopefully, the landowner will take the time to have the operator correct the misapplication.

FWQG Audit

The third step in the Phase I Monitoring process occurs after the harvesting activity is completed. At this point, a FWQG Audit will be conducted. The procedure is as follows.

1. The area forester gives an on-site orientation to the audit team. During the orientation any specific concerns regarding FWQG implementation will be discussed. Subjects of concern may have been identified on the TSIR, may result from the area forester's knowledge of the sale area or may be specific to topography, proximity to water, soil type and other landscape characteristics.
2. Except as noted below for roads, examine and rate the entire sale area. This requires that all roads be traversed (walk or drive), that all skid trails be walked and that the full length of streams inside the sale boundary be walked. Streams in proximity to a sale boundary should be examined for signs of sedimentation that may be associated with the timber sale. The team may stay together or split-up to examine the sale area.
3. Take photographs of all conditions likely to be rated 1 (major and prolonged impacts on soil and water resources) under effectiveness.

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4. After examination of the entire sale area, the audit team discusses its observations. One person fills in the Post-Harvest Field Review form. The ratings on the form represent the team's consensus.
- a. Determine which FWQGs are applicable to the site. A maximum of eight FWQGs will be rated. On the form, check all that apply.
 - b. There is a maximum of 76 elements to rate under the eight FWQGs. Ignore elements of non-applicable FWQGs. By design, some elements are repetitive or have little to do with water quality.
 - c. Rate the site for FWQG application and effectiveness. Remember, we are rating elements that may impact water quality, forest productivity, and other soil and water resources. We are not rating aesthetics. The application rating uses a five-point scale. The effectiveness rating uses a six-point scale.
 - d. The application rating measures whether the FWQG element has been applied, whether it has been applied correctly, and whether it has been applied in a proper location. The rating guide is on the form. Ratings 5 and 4 are self-explanatory. A rating of 3 means that the departures are of small magnitude distributed over a localized area, or over a relatively larger area where the potential for adverse impact is low. A rating of 2 means that the departures are of large magnitude, or that the FWQG element has been repeatedly neglected. A rating of 1 means that there is no evidence of the operator applying the element, and that risk of or damage to soil and water resources, is obvious.
 - e. The effectiveness rating serves as an impact indicator, and qualitatively evaluates how well the FWQG elements protect soil and water resources. The rating represents a snapshot (single point-in-time) of current conditions. The definitions of ratings are on the form. Rate the FWQG element according to the team's assessment of how well the element is performing. For example, has application (or lack of application) increased or decreased the likelihood of sediment delivery to a water body?
 - f. When rating for roads, evaluate only the portion of the road that has been constructed or reconstructed solely for the purpose of the timber sale.

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- g. Remember that adverse water quality impacts may result from activity not associated with forest practices. For example, grazing-related impacts, or impacts associated with use of roads for something other than hauling logs may present difficulties when rating FWQG elements. In this occurs, please make a note on the form.
 5. Send the original completed form to the Stewardship Coordinator, keep a copy on file in the area office.

Phase II Monitoring

Phase II repeats the Phase I process for selected sites, but with an ID team rather than just division personnel. Using the ID team approach will achieve two purposes:

- ensuring consistent implementation of assessment methods between sites across the state. (Proper use of standardized methods will result in comparable data between areas.)
- reducing the level of bias associated with internal or “in-house” monitoring. (The division has an obligation to provide credible and legitimate information to constituents.)

Site Selection

Monitoring the FWQGs (both phases) will occur on non-federal lands. Since Phase I monitoring targets all harvesting activities occurring across the state, consideration of site selection criteria and distribution is not warranted. With Phase II monitoring, however, site selection criteria will be incorporated into the overall program design.

Site Selection Process

Selection of Phase II sites will include the following:

- identifying all sites which satisfy one or more of the selection criteria.
- prioritizing all sites which satisfy one or more of the site selection criteria.
- verifying that the sites selected for audit satisfy one or more of the selection criteria and are prioritized accordingly. (The objective of the site verification is to minimize the potential for the audit team traveling to an audit site and upon arrival finding the site does not satisfy one or more of the site selection criteria. The field verification of selected sites will be accomplished through consultation with the Area Forester and/or Area Manager or by pre-audit site visits.)

Site Selection Criteria

Sites should be selected if they satisfy one or more of the following criteria. In general, the more criteria satisfied, the higher the priority for selection.

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- the sale area includes a SMZ (a perennial stream lies within the sale boundary).
 - sale area includes highly erodible soil.
 - the sale is within a watershed on the TMDL list and sediment is the identified pollutant.
 - a timber sale inspection report identifies a specific NPS concern.
 - the Area Manager or Area Forester recommends a Phase II audit.

Number of Sites to Audit

The number of Phase I sites satisfying the Phase II selection criteria, the time commitment from team members and the relative efficiency of the team conducting the audits are the most important factors to consider when determining the number of sites to audit. During the first round of Phase II, as many sites as possible under operational constraints will be examined. As experience with Phase II increases, the number of sites will be easier to determine.

Distribution of Audit Sites

If NOIs submitted to the division include all Areas, at least one site per Area will be selected for Phase II.

General Time Line for Phase II

- September - Inform landowners that the division will be commencing field reviews, and request permission to enter property. Request the participation of audit team members in the upcoming audits.
- October - Determine the number of sites to audit based on formulated site selection criteria. Ensure adequate distribution of audit sites by ownership.
- November - Confirm audit team membership. Inform team members of the audit dates, calibration training and post audit team meeting.
- March - Candidate site information will be compiled from NOI forms and Phase I field reviews.
- April - Complete site selection and audit schedule. Inform team members, agencies and companies with final audit schedule.
- June - Conduct calibration training session and begin the Phase II audit process.
- October - Conduct post-audit meeting with audit team members.

When completed, Phase II audit information will be compiled, analyzed and assembled into a written report.

Team Member Recruitment

A core ID team will be assembled to perform Phase II audits. If there are too many sites to audit during this phase, a second team may be assembled. The core team may be augmented by local expertise or interested persons on a case-by-case basis.

The process for establishing team membership should begin in the fall of the year preceding the Phase II audits. Prospective team members need to be identified and contacts made requesting team membership. The division will send letters to prospective team members requesting participation in Phase II. Once team membership has been established, follow-up procedures confirming audit team membership will be initiated. Team members will be informed of audit dates, calibration training and post-audit team meetings. The division may allow for reimbursement of expenses.

The ID team will be limited to five members with combined expertise in hydrology, engineering, silviculture and soils. Because of the involvement of Utah State University (USU) in landowner and logger education, USU will be invited to commit a representative for Phase II audits.

Team Leader and Duties

The team will have assigned a team leader. The team leader is responsible for providing general leadership and direction to the team. Duties of the team leader include the following:

- contacting landowners one month in advance of the audits. Inform landowner of the date of the audit on their site and to schedule a time and place to meet.
- inform team members two weeks in advance the audit sites, date of audits, audit times and meeting places.
- making any necessary hotel accommodations for the team.
- making sure time sheets, travel vouchers and per diem forms are filled out correctly and returned in a timely manner.
- complete and maintain a master copy of each audit the team conducts and submit the completed forms to the Forest Stewardship Coordinator upon completion of all audits.

Calibration Audits and Process Review

It is desirable that those conducting FWQG field audits do so in a manner which can be consistently applied across the state. The first few Phase II audits and subsequent discussion among team members will enhance consistency. A review meeting will follow all Phase I and II audits. The purpose of the review meeting is to address with audit team members issues or concerns that arose during the field review process with the objective of refining the process.

FWQG Audit Report

Completion of Phase II field audits will initiate compilation and analysis of field data. A written analysis and summary report of findings will be prepared. The target audience includes landowners, forest product operators, resource managers, academic institutions and legislators. The report will be made available to the public.

APPENDIX C

FWQG CONSISTENCY GUIDELINES



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1. Determine which FWQG are applicable to the site.
 2. Evaluate the entire timber sale.
 3. Evaluate the site for FWQG application and effectiveness only. Remember, we are evaluating FWQG that may impact water quality and other soil and water resources. We are not evaluating aesthetics.
 4. Rate only the activity or FWQG that you can see (i.e. we are not rating fault. Rather, we are rating existing conditions).
 5. When rating for roads, audit only the portion of the road that has been installed or reconstructed solely for the purpose of the timber sale.
 6. Complete a timber sale inspection report and a FWQG Evaluation & Monitoring Field Audit Worksheet for each timber sale as part of routine follow-up with the landowner and/or operator.
 7. There are a maximum of 76 practices to evaluate and rate for each site. The application rating is based upon a 5-point scale. The effectiveness rating is based upon a 6-point scale.

Application

The application rating measures whether the FWQG has been applied, whether it has been applied correctly and whether it has been applied in the proper location. Rate FWQG application by first identifying if the FWQG is applicable to the site. If so, determine if it was applied to the correct technical standard, at the correct frequency and in the proper location. The rating guide for FWQG application is:

- 5 - Operation exceeds FWQG
- 4 - Operation meets FWQG
- 3 - Minor departure from FWQG
- 2 - Major departure from FWQG
- 1 - Gross neglect of FWQG

Note: Lack of adequate application or mis-application are considered departures from the FWQG.

Ratings 5 and 4 are self-explanatory. A rating of 3, minor departure, applies to departures of small magnitude distributed over a localized area, or over a larger area where the potential for impact is low. A rating of 2, major departure, applies to departures of large magnitude or to FWQGs being repeatedly neglected. A rating of 1, gross neglect, applies where risks to soil and water resources are obvious while there is no evidence indicating that operators applied the FWQG.

Effectiveness

The effectiveness rating serves as an “impact” indicator, and qualitatively evaluates how well the FWQGs protect soil and water resources within a single point-in-time reference. Rate FWQG effectiveness to determine how well the application of the applied FWQG is performing. For example, has the application or lack thereof of a particular FWQG increased (or decreased) the likelihood of sediment delivery to a stream? The rating guide for FWQG effectiveness is:

- 6 - Improved protection of soil & water resources
- 5 - Adequate protection of soil & water resources
- 4 - Minor and temporary impacts on soil & water resources
- 3 - Minor and prolonged impacts on soil & water resources
- 2 - Major and temporary impacts on soil & water resources
- 1 - Major and prolonged impacts on soil & water resources

Note: Lack of effectiveness results in impacts.

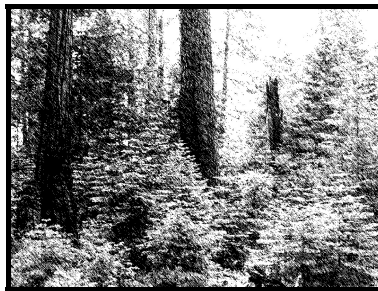
In addition, the following terms and definitions apply to application and effectiveness rating:

- Adequate:** small amount of material eroded; material does not reach drainages, streams, lakes or other bodies of water.
- Minor:** small impact potential; some erosion occurs, but delivery of material to water resources is not clearly evident.
- Major:** large impact potential; eroded material is clearly being delivered to water resources.
- Temporary:** generally, impacts lasting less than one year or no more than one runoff season.
- Prolonged:** generally, impacts lasting more than one year.

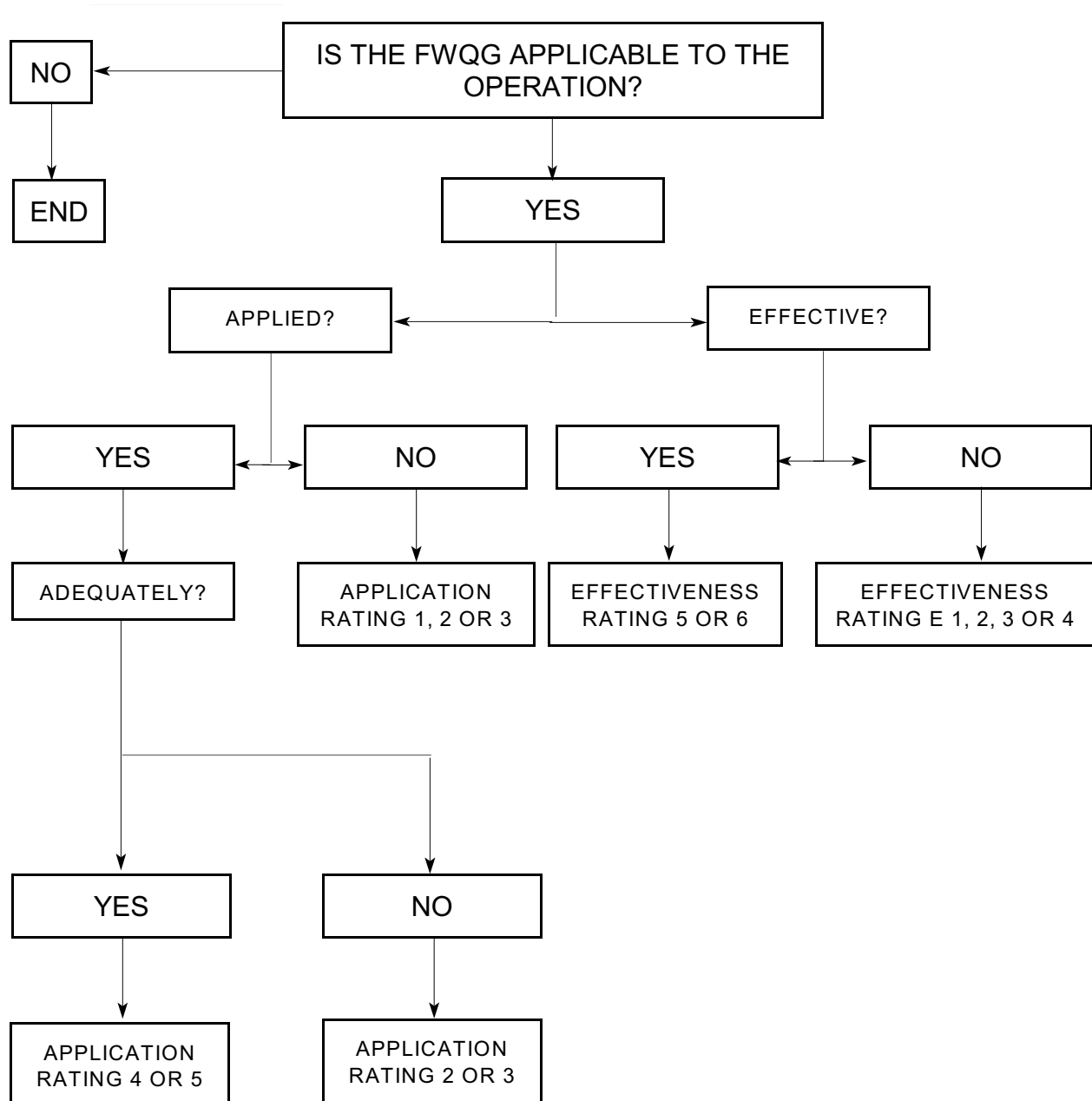
In some cases, a FWQG may not apply (i.e. no stream crossings, no new road construction, slash disposal not complete. Also, water quality impacts may occur not resulting directly from harvesting activity. For example, grazing and road use for purposes other than hauling logs can cause difficulties with rating applicable FWQGs. In these situations, please make a note on the form. In cases where the FWQG does not apply, make a note on the form and do not rate.

APPENDIX D

FWQG FLOW CHART



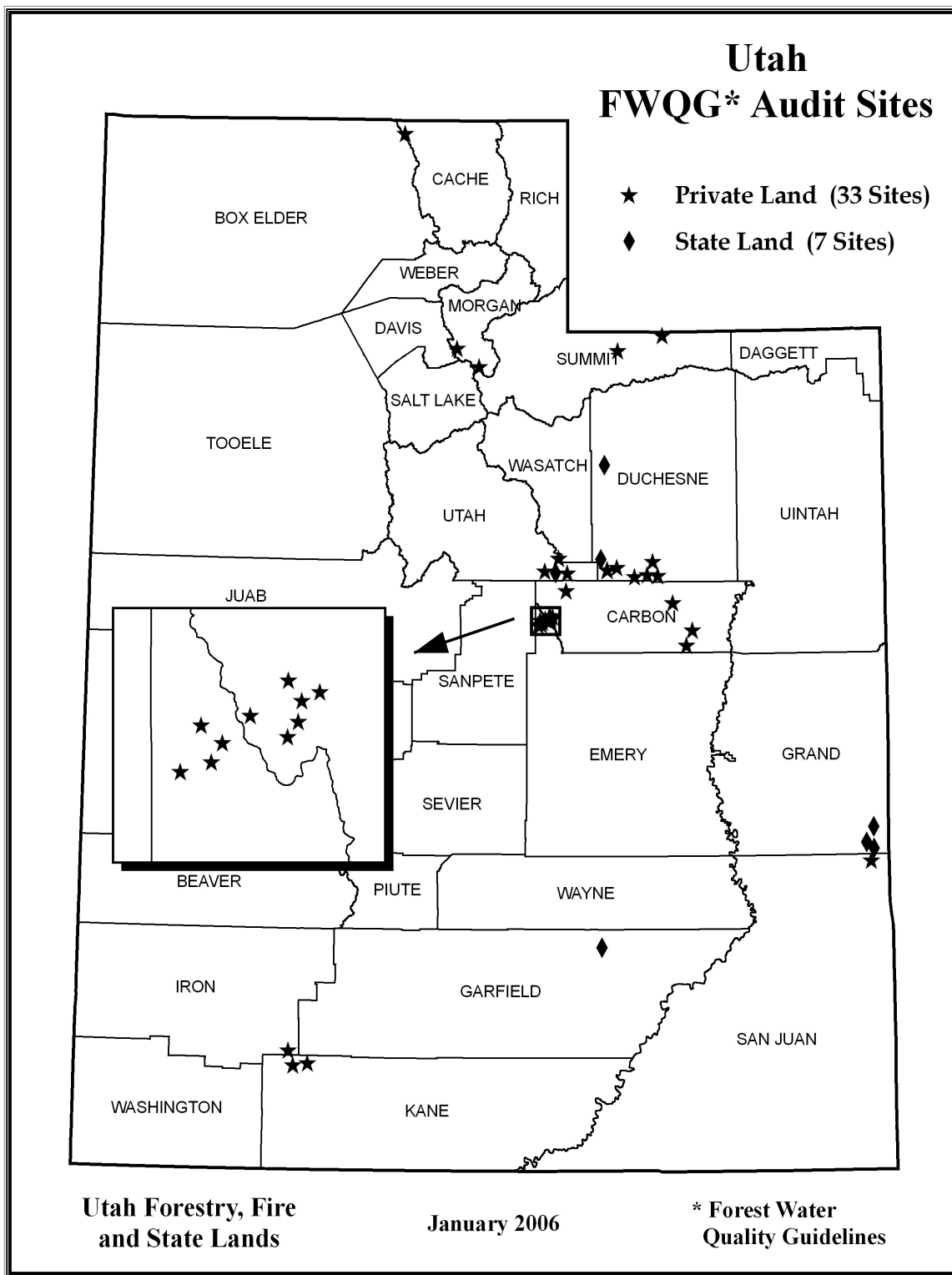
FLOW CHART DEPICTING ON-SITE POST- HARVEST FWQG AUDIT RATING SYSTEM



APPENDIX E

FWQG AUDIT SITE LOCATION MAP

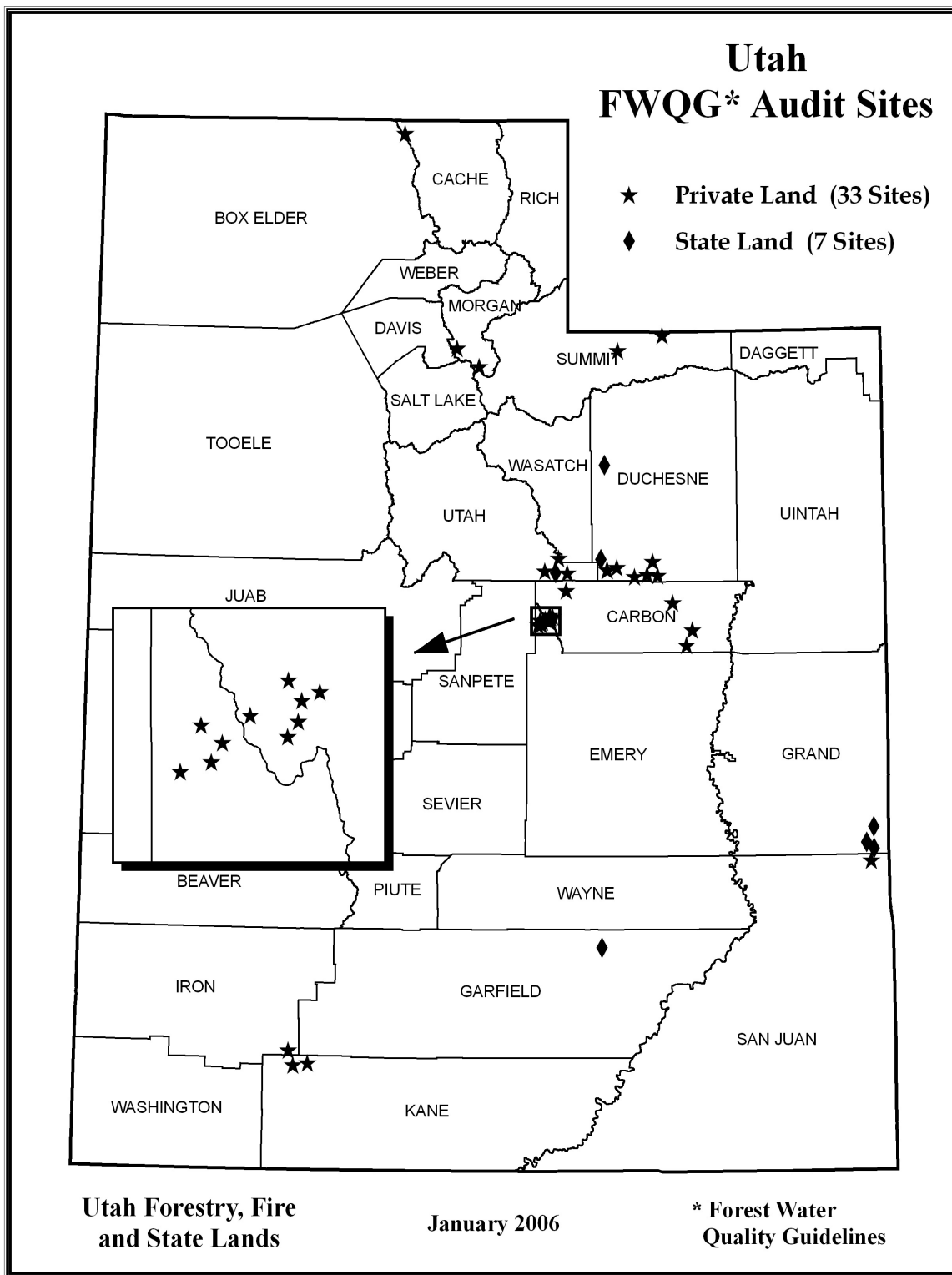




APPENDIX E

FWQG AUDIT SITE LOCATION MAP





APPENDIX F

LIST OF FWQG AUDITS



Audit Number	Ownership	NOI Number	Area	County
1	Private	0015WF25	Wasatch Front	Utah
2	Private	0016WF25	Wasatch Front	Utah
3	Private	0027WF15	Wasatch Front	Morgan
4	Private	0029WF25	Wasatch Front	Utah
5	Private	0050WF15	Wasatch Front	Morgan
6	Private	0012NE07	Northeast	Duchesne
7	Private	0014NE07	Northeast	Duchesne
8	State	0017NE07	Northeast	Duchesne
9	State	0020NE07	Northeast	Duchesne
10	Private	0023NE07	Northeast	Duchesne
11	Private	0024NE07	Northeast	Duchesne
12	Private	0030NE07	Northeast	Duchesne
13	Private	0031NE07	Northeast	Duchesne
14	Private	0032NE07	Northeast	Duchesne
15	Private	0011SE04	Southeast	Carbon
16	Private	0018SE04	Southeasat	Carbon
17	Private	0026SE04	Southeast	Carbon
18	Private	0037SE04	Southeast	Carbon
19	Private	0041SE04	Southeast	Carbon
20	Private	0042SE08	Southeast	Emery
21	Private	0043SE08	Southeast	Emery
22	Private	0045SE08	Southeast	Emery
23	Private	0019SW 13	Southwest	Kane
24	State	0021SW 09	Southwest	Garfield
27	State	0015WF25-03	Wasatch Front	Utah
28	Private	0018NE22-03	Northeast	Summit
29	Private	0012SE08-03	Southeast	Emery
30	Private	0020SE04-03	Southeast	Carbon
31	Private	0013SW 13-03	Southwest	Kane
32	Private	0019SW 11-03	Southwest	Iron
33	Private	0011BR03-04	Bear River	Cache
35	Private	0019NE22-04	Northeast	Summit
36	State	0012SE10-04	Southeast	Grand
37	Private	0013SE19-04	Southeast	San Juan
38	State	0014SE10-04	Southeast	Grand
39	State	0020SE10-05	Southeast	Grand
40	Private	0021SE04-05	Southeast	Carbon
41	Private	0025SE04-05	Southeast	Carbon
42	Private	0029SE04-05	Southeast	Carbon
43	Private	0030SE04-05	Southeast	Carbon

APPENDIX G
FWQG POST-HARVEST FIELD REVIEW FORM



FOREST WATER QUALITY GUIDELINES POST-HARVEST FIELD REVIEW

TEAM LEADER/RECORDER: _____

NOTIFICATION NUMBER: _____

DATE: _____ / _____ / _____

TEAM MEMBERS: _____

GENERAL SITE DESCRIPTION					
Sale/Project Name:			Operator/Contractor:		
Location: T ___ N ___ S; R ___ E ___ W			Section(s):	County:	Acres:
Ownership: <input type="checkbox"/> State <input type="checkbox"/> Private <input type="checkbox"/> Federal <input type="checkbox"/> Other			Watershed: _____ HUC: _____		
SITE CONDITIONS (✓ all that apply)					
Soil Erodibility <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	Topography <input type="checkbox"/> Flat <input type="checkbox"/> Gentle <input type="checkbox"/> Moderate <input type="checkbox"/> Steep	Slope <input type="checkbox"/> 0-5% <input type="checkbox"/> 5-20% <input type="checkbox"/> 20-40% <input type="checkbox"/> 40%+	Aspect (in degrees) <input type="checkbox"/> 0-90 <input type="checkbox"/> 90-180 <input type="checkbox"/> 180-270 <input type="checkbox"/> 270-360	Water Resource(s) <input type="checkbox"/> Class I Stream <input type="checkbox"/> Class II Stream <input type="checkbox"/> Reservoirs, lakes, etc. <input type="checkbox"/> Wetland	Stream Crossings <input type="checkbox"/> Ford # _____ <input type="checkbox"/> Culvert # _____ <input type="checkbox"/> Bridge # _____
PRACTICES (✓ all that apply)					
Forest Water Quality Guidelines <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Pre-harvest Planning <input type="checkbox"/> Prescribed Fire <input type="checkbox"/> Roads, Trails, Crossings & Landings </div> <div> <input type="checkbox"/> Timber Harvesting <input type="checkbox"/> Chemical Mgm't <input type="checkbox"/> Site Prep, Regeneration & Re-Vegetation </div> <div> <input type="checkbox"/> Streamside Mgm't Zone <input type="checkbox"/> Forested Wetland </div> </div>					
R System Used <input type="checkbox"/> Seed Tree <input type="checkbox"/> Shelterwood <input type="checkbox"/> Clearcut <input type="checkbox"/> I/G Selection	Species Harvested <input type="checkbox"/> P. Pine <input type="checkbox"/> Spruce/fir <input type="checkbox"/> LP Pine <input type="checkbox"/> Aspen <input type="checkbox"/> Doug-Fir <input type="checkbox"/> White fir <input type="checkbox"/> Mixed Conifer	Harvest Method <input type="checkbox"/> Ground <input type="checkbox"/> Cable <input type="checkbox"/> Aerial	Roads <input type="checkbox"/> New construction _____ mi. <input type="checkbox"/> Reconstruction _____ mi. <input type="checkbox"/> Improvement _____ mi.	Slash disposal <input type="checkbox"/> Pile & Burn <input type="checkbox"/> Lop & Scatter <input type="checkbox"/> Crush/Chip <input type="checkbox"/> Brdcast. Burn	
RATING GUIDE					
APPLICATION 5 - Operation exceeds FWQG 4 - Operation meets FWQG 3 - Minor departure from FWQG 2 - Major departure from FWQG 1 - Gross neglect of FWQG			EFFECTIVENESS 6 - Improved protection of <i>forest</i> , soil & water resources 5 - Adequate protection of <i>forest</i> , soil & water resources 4 - Minor & temporary impacts on <i>forest</i> , soil & water resources 3 - Minor & prolonged impacts on <i>forest</i> , soil & water resources 2 - Major & temporary impacts on <i>forest</i> , soil & water resources 1 - Major & prolonged impacts on <i>forest</i> , soil & water resources		
DEFINITIONS					
ADEQUATE: FWQG applied correctly; small amount of material eroded; material does <u>not</u> reach drainages, streams, lakes or wetlands. MINOR: FWQG applied incorrectly; small impact potential; erosion and delivery of material to water resources <u>not</u> clearly evident. MAJOR: FWQG not applied; large impact potential; erosion and delivery of material to water resources clearly evident. GROSS: Gross neglect of FWQG application; disregard for soil erosion and water quality; large and direct impacts are clearly evident. TEMPORARY: Impacts lasting one year or less; no more than one runoff season. PROLONGED: Impacts lasting more than one year.					

APPLICATION 5 - Operation exceeds FWQG 4 - Operation meets FWQG 3 - Minor departure from FWQG 2 - Major departure from FWQG 1 - Gross neglect of FWQG		EFFECTIVENESS 6 - Improved protection of <i>forest</i> , soil & water resources 5 - Adequate protection of <i>forest</i> , soil & water resources 4 - Minor & temporary impacts on <i>forest</i> , soil & water resources 3 - Minor & prolonged impacts on <i>forest</i> , soil & water resources 2 - Major & temporary impacts on <i>forest</i> , soil & water resources 1 - Major & prolonged impacts on <i>forest</i> , soil & water resources			
STREAMSIDE MANAGEMENT ZONE		Applies? (Y/N)	Apply	Effect	Comments
1.	Recommended SMZ width and “undisturbed strip” is maintained. Indicate average width based on stream class: _____ ft.				
2.	The SMZ boundary is clearly marked with flagging, paint or signs.				
3.	Adequate tree, shrub and other ground cover is maintained to avoid potential regeneration problems, promote bank stabilization and sediment trapping.				
4.	Exclusion of heavy equipment and skidders in the SMZ except on established roads.				
5.	Minimize soil disturbance and restrict mechanical site preparation in the SMZ.				
6.	Exclusion of slash in the SMZ from adjacent areas. Exclusion of piling and burning in the SMZ.				
7.	Avoid skidding in the SMZ to prevent channel damage, build-up of destructive runoff flows and erosion .				

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ROADS, SKID TRAILS, LANDINGS & STREAM CROSSINGS		Applies? (Y/N)	Apply	Effect	Comments
Planning for Roads					
1.	Plan roads to fit within transportation networks and that fit the natural terrain as much as possible. Minimize road construction, cuts, fills and the number of roads within the harvest area.				
2.	Locate and design roads upslope of natural drainages to allow road surfaces to drain. Road surface slope should utilize natural drainage as much as possible. Design cross culverts, ditches, dips, water bars to direct water off road surface.				
3.	Avoid sustained excessive grades of 10-20%.				
4.	Avoid road construction in unstable areas.				
5.	Minimize the number of stream crossings. Cross streams at right angles to channel to reduce sedimentation and debris from entering the stream.				
6.	Select the most appropriate stream crossing (ford, culvert, bridge).				
7.	Design stream crossings to handle peak runoff and flood waters.				

APPLICATION		EFFECTIVENESS			
5 - Operation exceeds FWQG 4 - Operation meets FWQG 3 - Minor departure from FWQG 2 - Major departure from FWQG 1 - Gross neglect of FWQG		6 - Improved protection of <i>forest</i> , soil & water resources 5 - Adequate protection of <i>forest</i> , soil & water resources 4 - Minor & temporary impacts on <i>forest</i> , soil & water resources 3 - Minor & prolonged impacts on <i>forest</i> , soil & water resources 2 - Major & temporary impacts on <i>forest</i> , soil & water resources 1 - Major & prolonged impacts on <i>forest</i> , soil & water resources			
Road Construction		Applies? (Y/N)	Apply	Effect	Comments
1.	Limit road construction activities during periods of excessive moisture or frozen ground.				
2.	Roads constructed to prevent excess material (debris, soil) from entering streams.				
3.	Road constructed to provide adequate drainage from the road surface (out-sloped, in-sloped) with appropriate features to reduce erosion.				
4.	Dips, water bars and culverts are constructed to effectively provide surface flow off the road.				
5.	Avoid constructing berms that may channel water down the road.				

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Stream Crossing	Applies? (Y/N)	Apply	Effect	Comments
1. Minimize the number of stream crossings.				
2. Placement of stream crossings should be timed to minimize water quality impacts when water flows are low, usually during late summer.				
3. Align placement of culverts with the natural grade of the stream channel. Place culverts slightly below the grade of the natural stream.				
4. Culvert protected against erosion by compacting fill material, providing rock armor, logs, seeding or other suitable material.				
5. Approaches to culverts compacted and graded to maintain a consistent road grade.				
6. Culverts and other stream crossing devices free and clear of debris.				
7. Plan stream crossings at right angles (perpendicular) to the stream channel.				

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Road Maintenance		Applies? (Y/N)	Apply	Effect	Comments
1.	Avoid grading unless maintenance is necessary. Unnecessary grading creates additional source of sediment.				
2.	Avoid cutting the toe of cut slopes when grading roads or pulling ditches.				
3.	Avoid placing side-cast material, soil and gravel into streams, SMZs or other water bodies. Excess material produced from grading should be feathered out or hauled away.				
4.	Avoid using roads during wet periods.				
5.	Erosion control features periodically inspected and maintained.				

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Skid Trails		Applies? (Y/N)	Apply	Effect	Comments
1.	Skid trails and skidding operations designed and located to minimize soil disturbance.				
2.	Avoid skidding directly up and down steep slopes for long distances.				
3.	Skid trails located away from natural drainage systems. Avoid concentrating runoff and limit grade where possible.				
4.	Minimize skidding during wet periods to limit soil displacement and compaction.				
5.	Appropriate water diversion devices installed to prevent channelization and erosion on skid trails.				
6.	Locate skid trails outside SMZ's.				
7.	Utilize appropriate skidding method commensurate with soil and topography.				

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Landings	Applies? (Y/N)	Apply	Effect	Comments
1. Landings located away from natural drainage systems and divert runoff to areas where vegetation can serve as a filter. For proper drainage, landings should be constructed with 3 to 10% slopes.				
2. Locate landings to avoid skidding down and across drainage bottoms.				
3. Minimize number and size of landings.				
4. Landings should be located outside SMZ's.				
5. Upon termination of operations, landings recontoured, revegetated and returned to a natural condition.				

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TIMBER HARVESTING		Applies? (Y/N)	Apply	Effect	Comments
1.	Avoid excessive soil compaction.				
2.	Avoid the use of ground-based equipment within the SMZ. Trees harvested in the SMZ should be end-lined or winched.				
3.	Utilize harvesting system best suited to topography to avoid excessive compaction, damage to residual stand and ensure adequate regeneration and revegetation.				
4.	When descending steep slopes, avoid the use of skidder blades for braking purposes.				
5.	Adequate road and skid trail drainage structures installed prior to commencement of operations.				
6.	Minimize slash accumulations and prevent excessive waste of resources by adhering to pre-determined utilization standards.				
7.	Reduce or minimize the amount of soil in slash piles by using brush blades for piling.				
8.	Avoid piling and burning slash in SMZ's.				
9.	Locate skid trails to minimize damage to regeneration.				

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SITE PREPARATION, REGENERATION AND REVEGETATION	Applies? (Y/N)	Apply	Effect	Comments
1. Slash disposal and treatment, by use of fire or mechanical means, completed to ensure optimal conditions for regeneration without causing excessive damage to soil or residual stand.				
2. Scarify soil only to the amount necessary or required for successful regeneration of desired species.				
3. Residual stocking levels adequate and best suited to site conditions.				
4. Road cuts, fills and other disturbed areas revegetated and/or stabilized, re-contoured and seeded with appropriate seed mixture best suited to site conditions.				

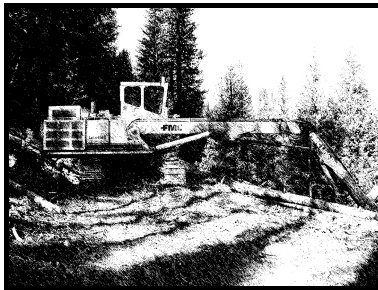
APPLICATION 5 - Operation exceeds FWQG 4 - Operation meets FWQG 3 - Minor departure from FWQG 2 - Major departure from FWQG 1 - Gross neglect of FWQG		EFFECTIVENESS 6 - Improved protection of <i>forest</i> , soil & water resources 5 - Adequate protection of <i>forest</i> , soil & water resources 4 - Minor & temporary impacts on <i>forest</i> , soil & water resources 3 - Minor & prolonged impacts on <i>forest</i> , soil & water resources 2 - Major & temporary impacts on <i>forest</i> , soil & water resources 1 - Major & prolonged impacts on <i>forest</i> , soil & water resources		
CHEMICAL MANAGEMENT	Applies? (Y/N)	Apply	Effect	Comments
1. Containers and facilities for chemical storage located outside the SMZ.				
2. Instructions, guidelines and all applicable laws followed when using pesticides and other chemicals.				
3. When using chemicals, petro-chemicals and anti-freeze, avoid mixing, fueling, servicing, spillage and cleaning equipment in or near streams, water bodies and SMZ's.				
4. Avoid draining used oil, fuel or anti-freeze onto the ground.				

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PRESCRIBED FIRE	Applies? (Y/N)	Apply	Effect	Comments
1. Prescribed burn plan prepared by qualified professional prior to burning.				
2. Appropriate location and construction of fire lines should follow contours and minimize soil disturbance.				
3. Minimize the impact of the burn to avoid excessive damage to residual vegetation and soil.				
4. Avoid piling and burning slash in SMZ's, lakes, reservoirs other water bodies.				
5. Minimize the amount of soil, dirt and other unburnable material in slash piles to allow efficient burning.				
6. Avoid burning on steep slopes where soil loss or erosion would occur.				

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FORESTED WETLANDS		Applies? (Y/N)	Apply	Effect	Comments
1.	Avoid locating or constructing roads, trails and landings in wetlands.				
2.	Avoid fueling or servicing equipment in wetlands.				
3.	Avoid operation of equipment in areas of open water, seeps and springs.				
4.	Conduct harvest activities in wetlands when ground is frozen, covered with snow or during extended dry periods to minimize rutting and compaction.				
5.	Keep open water free from slash.				
6.	Provide for adequate cross-road drainage to minimize changes to natural surface and subsurface wetland flows.				
7.	Minimize rutting in wetlands. Where possible, skid around wetlands or endline felled trees out of wetland areas.				
8.	Utilize low ground pressure equipment whenever possible.				
9.	Avoid skidding through open wetland meadows and other wet areas.				
10.	Divert runoff from roads, trails and landings to upland areas above wetlands to reduce silting of wetland area.				

APPENDIX H

FWQG RATINGS BY PRACTICE AND OWNERSHIP



FWQG Rating by Practice and Ownership Group														
Streamside Management Zone (SMZ)		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- SMZ width; "undisturbed" strip	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	10	0	23	0	0	0	1	9	0	23
	Sub-Total	0	0	0	10	0	30	0	0	0	1	9	0	30
2- SMZ boundary clearly marked	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	1	1	0	8	1	22	0	0	0	2	9	0	22
	Sub-Total	1	1	0	8	1	29	0	0	0	2	9	0	29
3- Adequate ground cover maintained	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	10	0	23	0	0	0	0	10	0	23
	Sub-Total	0	0	0	10	0	30	0	0	0	0	10	0	30
4- Exclusion of heavy equipment in SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	1	10	0	22	0	0	0	1	10	0	22
	Sub-Total	0	0	1	10	0	29	0	0	0	1	10	0	29
5- Minimize soil disturbance	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	9	0	24	0	0	0	0	9	0	24
	Sub-Total	0	0	0	9	0	31	0	0	0	0	9	0	31
6- Exclusion of slash; pile and burning in SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	2	8	0	23	0	0	0	2	8	0	23
	Sub-Total	0	0	2	8	0	30	0	0	0	2	8	0	30
7- Avoid skidding in SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	1	9	0	23	0	0	0	1	9	0	23
	Sub-Total	0	0	1	9	0	30	0	0	0	1	9	0	30
Total SMZ Practice Rating		1	1	4	64	1	209	0	0	0	7	64	0	209

FWQG Rating by Practice and Ownership Group														
Planning for Roads		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Minimize road construction	State	0	0	0	6	0	1	0	0	0	0	6	0	1
	Private	0	2	5	21	1	4	0	1	3	7	18	0	4
	Sub-Total	0	2	5	27	1	5	0	1	3	7	24	0	5
2- Locate/design roads to allow drainage	State	0	1	2	3	0	1	0	0	0	4	2	0	1
	Private	0	3	8	16	0	6	1	1	2	11	12	0	6
	Sub-Total	0	4	10	19	0	7	1	1	2	15	14	0	7
3- Avoid sustained excessive grades	State	0	0	0	6	0	1	0	0	0	0	6	0	1
	Private	0	1	7	19	0	6	1	0	3	6	17	0	6
	Sub-Total	0	1	7	25	0	7	1	0	3	6	23	0	7
4- Avoid road construction in unstable areas	State	0	0	0	6	0	1	0	0	0	0	6	0	1
	Private	0	0	1	24	0	8	0	0	0	3	22	0	8
	Sub-Total	0	0	1	30	0	9	0	0	0	3	28	0	9
5- Minimize number of stream crossings	State	0	0	1	0	0	6	0	0	0	1	0	0	6
	Private	0	0	1	10	1	21	0	0	0	1	11	0	21
	Sub-Total	0	0	2	10	1	27	0	0	0	2	11	0	27
6- Select appropriate stream crossing	State	0	0	1	0	0	6	0	0	0	1	0	0	6
	Private	0	0	0	10	1	22	0	0	0	1	10	0	22
	Sub-Total	0	0	1	10	1	28	0	0	0	2	10	0	28
7- Design crossings to handle peak runoff	State	0	0	1	0	0	6	0	0	0	1	0	0	6
	Private	0	0	1	9	0	23	0	0	0	1	9	0	23
	Sub-Total	0	0	2	9	0	29	0	0	0	2	9	0	29
Total Planning for Roads Practice Rating		0	7	28	130	3	112	2	2	8	37	119	0	112

FWQG Rating by Practice and Ownership Group														
Road Construction		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Limit road construction	State	0	0	0	5	0	2	0	0	0	0	5	0	2
	Private	0	0	4	25	0	4	0	0	1	5	23	0	4
	Sub-Total	0	0	4	30	0	6	0	0	1	5	28	0	6
2- Roads constructed to prevent debris	State	0	0	1	1	0	5	0	0	0	1	1	0	5
	Private	0	1	5	14	0	13	0	0	3	5	12	0	13
	Sub-Total	0	1	6	15	0	18	0	0	3	6	13	0	18
3- Adequate drainage provided	State	0	1	3	2	0	1	0	0	0	4	2	0	1
	Private	0	6	7	14	0	6	1	1	2	10	13	0	6
	Sub-Total	0	7	10	16	0	7	1	1	2	14	15	0	7
4- Dips, water bars and culverts constructed	State	0	1	2	3	0	1	0	0	0	4	2	0	1
	Private	0	6	5	13	0	9	1	1	2	9	11	0	9
	Sub-Total	0	7	7	16	0	10	1	1	2	13	13	0	10
5- Avoid constructing berms	State	0	1	2	3	0	1	0	0	0	3	3	0	1
	Private	0	3	7	17	0	6	1	0	2	8	16	0	6
	Sub-Total	0	4	9	20	0	7	1	0	2	11	19	0	7
Total Road Construction Practice Rating		0	19	36	97	0	48	3	2	10	49	88	0	48

FWQG Rating by Practice and Ownership Group														
Stream Crossing		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Minimize number of stream crossings	State	0	0	0	1	0	6	0	0	0	0	1	0	6
	Private	0	0	2	10	0	21	0	0	0	2	10	0	21
	Sub-Total	0	0	2	11	0	27	0	0	0	2	11	0	27
2- Crossings placed to minimize impacts	State	0	0	0	1	0	6	0	0	0	0	1	0	6
	Private	0	0	0	8	0	25	0	0	0	0	8	0	25
	Sub-Total	0	0	0	9	0	31	0	0	0	0	9	0	31
3- Culverts aligned w/grade of stream channel	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	9	0	24	0	0	0	0	9	0	24
	Sub-Total	0	0	0	9	0	31	0	0	0	0	9	0	31
4- Culvert protected against erosion	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	3	6	0	24	0	0	0	4	5	0	24
	Sub-Total	0	0	3	6	0	31	0	0	0	4	5	0	31
5- Approaches maintain consistent road grade	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	3	6	0	24	0	0	0	3	6	0	24
	Sub-Total	0	0	3	6	0	31	0	0	0	3	6	0	31
6- Culverts/other devices clear of debris	State	0	0	1	0	0	6	0	0	0	1	0	0	6
	Private	0	0	0	9	0	24	0	0	0	0	9	0	24
	Sub-Total	0	0	1	9	0	30	0	0	0	1	9	0	30
7- Crossings perpendicular to stream channel	State	0	0	0	1	0	6	0	0	0	0	1	0	6
	Private	0	0	1	9	0	23	0	0	0	1	9	0	23
	Sub-Total	0	0	1	10	0	29	0	0	0	1	10	0	29
Total Stream Crossing Practice Rating		0	0	10	60	0	210	0	0	0	11	59	0	210

FWQG Rating by Practice and Ownership Group														
Road Maintenance		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Avoid grading unless necessary	State	0	0	0	6	0	1	0	0	0	0	6	0	1
	Private	0	0	1	24	0	8	0	0	0	4	21	0	8
	Sub-Total	0	0	1	30	0	9	0	0	0	4	27	0	9
2- Avoid cutting toe-slopes	State	0	0	1	2	0	4	0	0	0	1	2	0	4
	Private	0	0	0	17	0	16	0	0	0	0	17	0	16
	Sub-Total	0	0	1	19	0	20	0	0	0	1	19	0	20
3- Avoid side-casting material into streams, SMZs and other water bodies	State	0	0	0	3	0	4	0	0	0	0	3	0	4
	Private	0	0	6	12	0	15	0	0	0	6	12	0	15
	Sub-Total	0	0	6	15	0	19	0	0	0	6	15	0	19
4- Avoid using roads during wet periods	State	0	0	1	6	0	0	0	0	0	1	6	0	0
	Private	0	0	11	13	1	8	0	0	0	11	14	0	8
	Sub-Total	0	0	12	19	1	8	0	0	0	12	20	0	8
5- Erosion control features maintained	State	0	0	0	5	0	2	0	0	0	0	5	0	2
	Private	1	1	2	17	0	12	1	0	2	2	16	0	12
	Sub-Total	1	1	2	22	0	14	1	0	2	2	21	0	14
Total Road Maintenance Practice Rating		1	1	22	105	1	70	1	0	2	25	102	0	70

FWQG Rating by Practice and Ownership Group														
Skid Trails		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Skid trails & skidding designed/located to minimize soil disturbance	State	0	1	0	6	0	0	0	0	0	1	6	0	0
	Private	0	1	6	23	0	3	1	1	2	4	22	0	3
	Sub-Total	0	2	6	29	0	3	1	1	2	5	28	0	3
2- Avoid skidding directly up/down steep slopes	State	0	1	0	4	0	2	0	0	0	1	4	0	2
	Private	0	3	3	23	0	4	1	1	0	6	21	0	4
	Sub-Total	0	4	3	27	0	6	1	1	0	7	25	0	6
3- Skid trails located away from drainages	State	0	0	1	5	0	1	0	0	0	1	5	0	1
	Private	0	0	5	24	0	4	0	1	1	5	22	0	4
	Sub-Total	0	0	6	29	0	5	0	1	1	6	27	0	5
4- Minimize skidding during wet periods	State	0	0	2	5	0	0	0	0	0	2	5	0	0
	Private	0	1	7	18	1	6	1	0	0	8	18	0	6
	Sub-Total	0	1	9	23	1	6	1	0	0	10	23	0	6
5- Water diversion devices installed to prevent channelization and erosion	State	0	1	1	4	0	1	0	0	0	2	4	0	1
	Private	0	4	6	16	0	7	0	0	3	7	16	0	7
	Sub-Total	0	5	7	20	0	8	0	0	3	9	20	0	8
6- Locate skid trails outside of SMZs	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	2	14	0	17	0	0	0	2	14	0	17
	Sub-Total	0	0	2	14	0	24	0	0	0	2	14	0	24
7- Appropriate skidding method	State	0	0	1	6	0	0	0	0	0	1	6	0	0
	Private	0	1	4	26	0	2	0	0	2	8	21	0	2
	Sub-Total	0	1	5	32	0	2	0	0	2	9	27	0	2
Total Skid Trails Practice Rating		0	13	38	174	1	54	3	3	8	48	164	0	54

FWQG Rating by Practice and Ownership Group														
Landings	Ownership	Application Rating						Effectiveness Rating						
		1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Located away from natural drainages; 3-10% slopes	State	0	0	1	5	0	1	0	0	0	1	5	0	1
	Private	0	0	2	29	0	2	0	0	0	6	25	0	2
	Sub-Total	0	0	3	34	0	3	0	0	0	7	30	0	3
2- Locate landings to avoid skidding down and across drainages	State	0	0	0	6	0	1	0	0	0	0	6	0	1
	Private	0	0	3	28	0	2	0	0	1	5	25	0	2
	Sub-Total	0	0	3	34	0	3	0	0	1	5	31	0	3
3- Minimize number and size of landings	State	0	0	0	7	0	0	0	0	0	0	7	0	0
	Private	0	0	1	31	0	1	0	0	0	4	28	0	1
	Sub-Total	0	0	1	38	0	1	0	0	0	4	35	0	1
4- Landings located outside SMZs	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	1	14	1	17	0	0	0	1	15	0	17
	Sub-Total	0	0	1	14	1	24	0	0	0	1	15	0	24
5- Landings returned to natural condition	State	0	0	2	5	0	0	0	0	0	2	5	0	0
	Private	0	3	5	20	0	5	0	2	0	5	21	0	5
	Sub-Total	0	3	7	25	0	5	0	2	0	7	26	0	5
Total Landings Practice Rating		0	3	15	145	1	36	0	2	1	24	137	0	36

FWQG Rating by Practice and Ownership Group														
Timber Harvesting		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Avoid excessive soil compaction	State	0	0	0	7	0	0	0	0	0	0	7	0	0
	Private	0	0	0	32	0	1	0	0	0	2	30	0	1
	Sub-Total	0	0	0	39	0	1	0	0	0	2	37	0	1
2- Avoid use of ground-based equipment within SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	14	0	19	0	0	0	0	14	0	19
	Sub-Total	0	0	0	14	0	26	0	0	0	0	14	0	26
3- Utilize harvest system best suited to topography	State	0	0	1	6	0	0	0	0	0	1	6	0	0
	Private	0	2	3	27	1	0	1	1	1	4	26	0	0
	Sub-Total	0	2	4	33	1	0	1	1	1	5	32	0	0
4- Avoid use of skidder blade for braking	State	0	1	0	1	0	5	0	0	0	1	1	0	5
	Private	0	0	1	26	0	6	0	0	1	1	25	0	6
	Sub-Total	0	1	1	27	0	11	0	0	1	2	26	0	11
5- Adequate drainage structures installed prior to operations	State	0	1	1	4	0	1	0	0	0	2	4	0	1
	Private	0	6	4	11	0	12	0	2	2	6	11	0	12
	Sub-Total	0	7	5	15	0	13	0	2	2	8	15	0	13
6- Minimize slash/prevent excessive waste; adhere to utilization standards	State	0	0	0	7	0	0	0	0	0	0	7	0	0
	Private	1	5	10	16	0	1	0	1	1	12	17	1	1
	Sub-Total	1	5	10	23	0	1	0	1	1	12	24	1	1
7- Reduce/minimize soil in slash; use brush blades for piling	State	0	0	1	6	0	0	0	0	0	1	6	0	0
	Private	0	0	3	27	0	3	0	0	0	6	24	0	3
	Sub-Total	0	0	4	33	0	3	0	0	0	7	30	0	3
8- Avoid piling and burning slash in SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	2	12	0	19	0	0	0	2	12	0	19
	Sub-Total	0	0	2	12	0	26	0	0	0	2	12	0	26
9- Locate skid trails to minimize damage	State	0	0	0	4	0	3	0	0	0	0	4	0	3
	Private	0	0	3	24	0	6	0	0	1	1	25	0	6
	Sub-Total	0	0	3	28	0	9	0	0	1	1	29	0	9
Total Timber Harvesting Practice Rating		1	15	29	224	1	90	1	4	6	39	219	1	90

FWQG Rating by Practice and Ownership Group														
Site Preparation, Regeneration & Revegetation		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Slash disposed/treated to ensure optimal conditions for regeneration	State	0	0	1	2	0	4	0	0	0	0	3	0	4
	Private	0	1	7	20	0	5	0	0	1	4	22	1	5
	Sub-Total	0	1	8	22	0	9	0	0	1	4	25	1	9
2- Scarify soil for successful regeneration	State	0	0	0	7	0	0	0	0	0	0	7	0	0
	Private	0	0	0	27	0	6	0	0	0	1	26	0	6
	Sub-Total	0	0	0	34	0	6	0	0	0	1	33	0	6
3- Residual stocking adequate and best suited to site conditions	State	0	0	1	6	0	0	0	0	0	1	6	0	0
	Private	0	2	4	19	1	7	1	1	1	3	20	0	7
	Sub-Total	0	2	5	25	1	7	1	1	1	4	26	0	7
4- Roads, cuts, fills revegetated and/or stabilized	State	0	0	2	3	0	2	0	0	1	2	2	0	2
	Private	0	2	8	15	0	8	0	0	1	7	17	0	8
	Sub-Total	0	2	10	18	0	10	0	0	2	9	19	0	10
Total Site Prep, Regen & Reveg Practice Rating		0	5	23	99	1	32	1	1	4	18	103	1	32

FWQG Rating by Practice and Ownership Group														
Chemical Management		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Containers/facilities located outside SMZ	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	6	0	27	0	0	0	0	6	0	27
	Sub-Total	0	0	0	6	0	34	0	0	0	0	6	0	34
2- Instructions, guidelines and laws followed when using pesticides, other chemicals	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	3	0	30	0	0	0	0	3	0	30
	Sub-Total	0	0	0	3	0	37	0	0	0	0	3	0	37
3- Avoid mixing, fueling, servicing equipment near streams, SMZ, waterbodies	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	1	6	0	26	0	0	0	1	6	0	26
	Sub-Total	0	0	1	6	0	33	0	0	0	1	6	0	33
4- Avoid draining used petro-fuels on ground	State	0	1	0	2	0	4	0	0	0	1	2	0	4
	Private	0	0	1	10	0	22	0	0	0	1	10	0	22
	Sub-Total	0	1	1	12	0	26	0	0	0	2	12	0	26
Total Chemical Management Practice Rating		0	1	2	27	0	130	0	0	0	3	27	0	130

FWQG Rating by Practice and Ownership Group														
Prescribed Fire		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Burn plan prepared prior to burning	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	4	0	29	0	0	0	0	4	0	29
	Sub-Total	0	0	0	4	0	36	0	0	0	0	4	0	36
2- Fireline construction follow contours and minimize soil disturbance	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	4	0	29	0	0	0	0	4	0	29
	Sub-Total	0	0	0	4	0	36	0	0	0	0	4	0	36
3- Minimize burn impact to minimize damage to residual vegetation and soil	State	0	0	0	1	0	6	0	0	0	0	1	0	6
	Private	0	0	0	13	0	20	0	0	0	0	13	0	20
	Sub-Total	0	0	0	14	0	26	0	0	0	0	14	0	26
4- Avoid piling/burning slash in SMZ, lakes, reservoirs and other waterbodies	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	13	0	20	0	0	0	0	13	0	20
	Sub-Total	0	0	0	13	0	27	0	0	0	0	13	0	27
5- Minimize amount of soil and other material in slash piles	State	0	0	0	3	0	4	0	0	0	0	3	0	4
	Private	0	0	1	16	0	16	0	0	0	1	16	0	16
	Sub-Total	0	0	1	19	0	20	0	0	0	1	19	0	20
6- Avoid burning on steep slopes	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	3	10	0	20	0	0	0	3	10	0	20
	Sub-Total	0	0	3	10	0	27	0	0	0	3	10	0	27
Total Prescribed Fire Practice Rating		0	0	4	64	0	172	0	0	0	4	64	0	172

FWQG Rating by Practice and Ownership Group														
Forested Wetlands		Application Rating						Effectiveness Rating						
	Ownership	1	2	3	4	5	NR	1	2	3	4	5	6	NR
1- Avoid roads, trails and landings in wetlands	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	6	0	27	0	0	0	0	6	0	27
	Sub-Total	0	0	0	6	0	34	0	0	0	0	6	0	34
2- Avoid fueling or servicing equipment in wetlands	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	5	0	28	0	0	0	0	5	0	28
	Sub-Total	0	0	0	5	0	35	0	0	0	0	5	0	35
3- Avoid using equipment in open water, seeps and springs	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	5	0	28	0	0	0	0	5	0	28
	Sub-Total	0	0	0	5	0	35	0	0	0	0	5	0	35
4- Conduct harvesting when ground is frozen, snow covered or dry periods	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	4	0	29	0	0	0	0	4	0	29
	Sub-Total	0	0	0	4	0	36	0	0	0	0	4	0	36
5- Keep open water free from slash	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	2	2	0	29	0	0	0	2	2	0	29
	Sub-Total	0	0	2	2	0	36	0	0	0	2	2	0	36
6- Adequate drainage to minimize changes in water flows	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	2	0	31	0	0	0	0	2	0	31
	Sub-Total	0	0	0	2	0	38	0	0	0	0	2	0	38
7- Minimize rutting in wetlands	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	4	0	29	0	0	0	0	4	0	29
	Sub-Total	0	0	0	4	0	36	0	0	0	0	4	0	36
8- Utilize low ground pressure equipment	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	1	0	32	0	0	0	0	1	0	32
	Sub-Total	0	0	0	1	0	39	0	0	0	0	1	0	39
9- Avoid skidding through open meadows and wet areas	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	0	4	0	29	0	0	0	0	4	0	29
	Sub-Total	0	0	0	4	0	36	0	0	0	0	4	0	36
10- Divert runoff from roads, trails and landings to reduce silting of wetland areas	State	0	0	0	0	0	7	0	0	0	0	0	0	7
	Private	0	0	2	1	0	30	0	0	0	2	1	0	30
	Sub-Total	0	0	2	1	0	37	0	0	0	2	1	0	37
Total Forested Wetlands Practice Rating		0	0	4	34	0	362	0	0	0	4	34	0	362

For information or assistance, contact the Division Headquarters or your local Division of Forestry, Fire & State Lands Office listed below:

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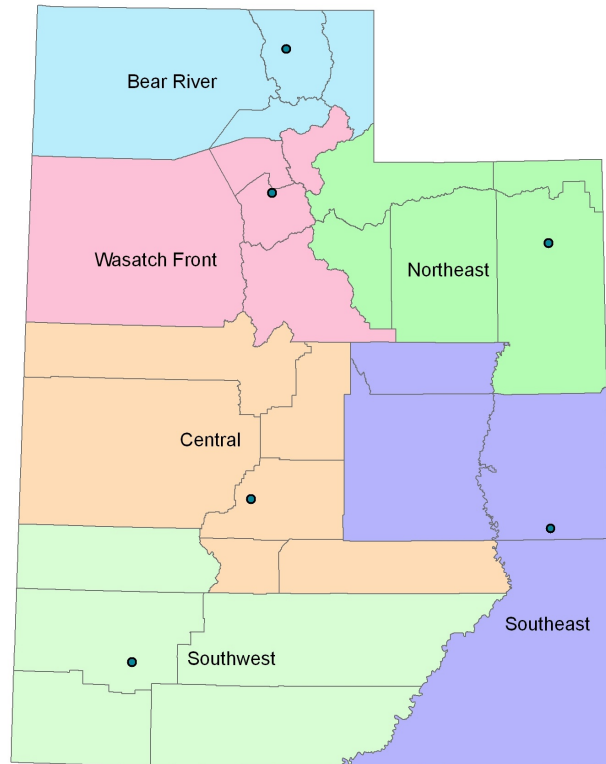
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